HORTICULTURAL ABSTRACTS

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nitialled reviews not by Bureau staff are by J. E. Crosse, M. H. Moore and J. M. Thresh of the East Malling Research Station, E. G. Cutter of the Department of Botany, Manchester University, F. A. Roach of the N.A.A.S. and by E. F. Allen and G. St. C. Fielden.

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MISCELLANEOUS.

General.

1685. ORGANIZATION FOR EUROPEAN ECONOMIC CO-OPERATION.
The consumption of fruit and vegetables in O.E.E.C. countries.
Docum. 1960 Ser. EPA/OEEC **22**, 1960, pp. 218, 12s. 6d.

This consists mainly of papers on consumer research and retailing but it also contains useful data on production, consumption and composition of numerous fruits and vegetables.

1686. BREVIGLIERI, N.
Aspetti e problemi dell'ortofrutticoltura italiana. **(Aspects and problems of Italian vegetable and fruit production.)**
Inf. Ortofruttic., 1960, **1**: 3-6.

Including annual production figures from 1910 to 1958 inclusive for globe artichokes, beans, cauliflowers, peas, apples, citrus, peaches, pears and tomatoes.

1687. SHEWELL-COOPER, W. E.
Commercial horticulture in Sardinia.
Agriculture, Lond., 1960, **67**: 374-7, illus.

A short account of recent trends.

1688. DERMEN, H.
Nature of plant sports.
Amer. hort. Mag., 1960, **39**: 123-73, bibl. 31, illus.

The anatomy and cytology of chimeras, naturally occurring leaf variegation, fruit sports and their propagation, graft-hybrids and graft-chimeras are discussed.—U.S.D.A., Beltsville, Md.

1689. WOODS, F. W.
Biological antagonisms due to phytotoxic root exudates.
Bot. Rev., 1960, **26**: 546-69, bibl. 217.

A review covering hypotheses, investigations and ecological phenomena.

Climate and air pollution.

(*See also* 2433, 2434, 2529, 3313.)

1690. BRESLAVEC, L. P., AND MILEŠKO, Z. F.
One of the possible causes of agglutination of chloroplasts in the bark and leaves of plants during the winter. [Russian.]
Bot. Žurnal, 1960, **45**: 900-2, bibl. 5, illus.

Agglutination of chloroplasts, which occurs in hazelnut and *Iresine*, but not in succulents or certain very hardy plants, may be due to dehydration caused by low temperatures.

1691. BEREND, I., AND CSUTI, [E.]
Füst- és porkárok a mezőgazdaságban. **(Smoke and dust damage in agriculture.)**
Növenyvéd. idősz. Kérd., 1959, No. 3, pp. 47-53, from *Hung. agric. Rev.*, 1960, **9**, Abstr. 153.

In Hungary smoke damage is more important than that caused by toxic dusts. Types of noxious smoke, gas and industrial waste waters are discussed in general, and soot and dust occurring in the vicinity of herbicide factories are dealt with in greater detail. This kind of air pollution causes proliferation of dicotyledons and a specific distortion on vines, the so-called "gingko-leaf" symptom. Injuries occur even when the presence of the herbicide dust on plants cannot be established microscopically.

1692. DAINES, R. H., AND OTHERS.
Damage to spinach and other vegetation in New Jersey from ozone and other airborne oxidants.
From abstr. in *Phytopathology*, 1960, **50**: 570.

Ozone injury has been observed on the foliage of spinach, parsley, radish, bean, petunia, tobacco and vine, and is suspected on chicory, endive, broccoli and carnation. Oxidant injury (silver leaf) primarily affected the undersurface of the youngest fully expanded leaves of spinach, celery, cultivated dandelion, red beet, lettuce, petunia and snapdragon. [See also *H.A.*, 30: 4662.]

1693. HILL, A. C., AND OTHERS.
Plant injury induced by atmospheric ozone.
From abstr. in *Phytopathology*, 1960, **50**: 639.

The phytotoxicity of ozone was studied on 34 plant species in controlled-atmosphere glasshouses. Plants were subjected at various stages of growth to ozone concentrations of 0·13–0·72 p.p.m. for 2-hour periods. Injury symptoms developed on 29 of the species. The most sensitive species included spinach and tobacco. There was a general tendency for sensitivity to ozone to increase with the age of the tissue. Palisade cells were most readily injured by ozone. On plants with adaxial palisade parenchyma ozone caused chlorotic spots and bleached necrotic areas to develop on the upper leaf surface. On plants with undifferentiated mesophyll, injury was equally apparent on either surface of the leaf. Necrotic spots which extended completely through the leaf developed on all species when injury was severe. Ozone caused conspicuous tumours to develop on broccoli leaves.

1694. DARLEY, E. F., MIDDLETON, J. T., AND GARBER, M. J.
Plant damage and eye irritation from ozone-hydrocarbon reactions.
J. agric. Food Chem., 1960, **8**: 483-5, bibl. 7.

Damage to 14-day-old Pinto bean plants exposed for 35 and 70 minutes to ozone, acrolein and 16 ozone-hydrocarbon mixtures is tabulated. Ozone reactions with propylene and 2-butene did not produce phytotoxicants.—Univ. Calif., Riverside.

1695. Ross, C. W., Wiebe, H. H., and Miller, G. W.
Respiratory pathways in various plants as related to susceptibility to fluoride injury.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxix.

The leaves of gladiolus varieties which were sensitive to hydrogen fluoride fumigation appeared to respire mainly by the glycolysis pathway, whereas resistant varieties were more dependent on the pentose phosphate pathway.—Utah St. Univ., Logan.

Seeds.

(*See also* 2320-2323, 2393, 2409, 2412, 2423, 2424, 2449, 2457, 2458, 2479-2481, 2505, 2514, 2531, 2532, 2547, 2578, 2598, 2599, 2669, 2670, 2677, 2811, 2857, 2913, 2931, 2952, 3007, 3098, 3145, 3155, 3221, 3352, 3397, 3499, 3595, 3610.)

1696. Lubatti, O. F., and Bunday, G.
The water content of seeds. I. The moisture relations of seed peas, etc.
J. Sci. Food Agric., 1960, **11**: 685-90, bibl. 12, illus.

A method of determining the hygroscopic equilibrium curve of seed peas is described. This curve is compared with that of broad beans.

1697. Lindenbein, W.
Keimungsphysiologische Probleme unter besonderer Berücksichtigung der biochemischen Keimprüfung. **(Physiological germination problems, with special reference to biochemical seed testing.)**
Saatgut-Wirtsch., 1960, **12**: 308-12, bibl. 15.

A review of general principles.

1698. Kadman-Zahavi, A.
Effects of short and continuous illuminations on the germination of *Amaranthus retroflexus* seeds.
Bull. Res. Coun. Israel, 1960, **9D**: 1-20, bibl. 33.

A certain percentage of the seeds germinated in darkness. This germination could be inhibited by white light when applied continuously from sowing, far-red being the active part. The majority of the seeds needed a light stimulus in order to germinate. A few seconds of white or red illumination was enough to cause full germination. Maximum sensitivity towards this stimulating illumination was reached only 2 or more days after sowing. The well-known reversible red—far-red reaction was operative in these seeds, but it was found that, when far-red illumination was applied for prolonged durations (hours instead of seconds), subsequent red illumination failed to promote germination. This was termed "the prolonged far-red effect". The responsiveness of the seeds to stimulating red illumination could be recovered after a certain dark period. In the reversible red—far-red reaction the inhibition by far-red was found to be maximal when far-red was applied not immediately after the red, but after an interval of 2–16 minutes. Low temperature during this interval further delayed the time of maximal effectiveness of far-red. This fact suggested that far-red reversed a temperature-sensitive dark-reaction that followed the red reaction. [From author's abstract.]—Hebrew Univ., Jerusalem.

1699. Haber, A. H.
A critical examination of the concepts "dormancy" and "germination" in view of recent studies with lettuce seeds.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xvii-xviii.

Studies have shown that in "dormant" seeds (i.e., under conditions where there has been and will be no visible expansion of the embryonic axis) a number of processes normally associated with growing systems may nonetheless occur. Among these are phosphate esterification, sulphate reduction, initiation and completion of mitosis and cytokinesis, and chlorophyll synthesis.—Oak Ridge nat. Lab., Tennessee.

Propagation.

(*See also* 2883, 3008-3010.)

1700. Tasmania Department of Agriculture, Horticulture Division.
Notes on propagation—tying and sealing.
Tasm. J. Agric., 1960, **31**: 214-15.

Trials of different methods of tying and sealing apple grafts included the use of (1) a raffia tie only, (2) a plastic tie only, (3) mastic sealing only, (4) raffia with mastic sealing, (5) calico tying strips impregnated with mastic, (6) raffia sealed at the top of the tie, and (7) plastic sealed at the top of the tie. The use of plastic ties only was the most promising method and the use of calico strips impregnated with mastic was also satisfactory.—Huon hort. Res. Stat.

1701. Bunt, A. C.
A review of the literature on plant containers and moulded blocks with special reference to the porosity of pots.
A.R. Glasshouse Crops Res. Inst. 1959, 1960, pp. 116-25, bibl. 37.

Pots made from clay, peat, paper, wood pulp and plastics and also peat blocks and soil blocks are considered.

702. Vogel, R.
Über Strahlungseinflüsse auf die Stomatabewegungen sowie deren Bedeutung für die Anwendung von Kunstlicht zur Pflanzenanzucht. **(The effect of radiation on the movement of stomata and its significance in the use of artificial light for the raising of plants.)** [English and French summaries 1½ pp. each.]
Gartenbauwiss., 1959, **24**: 488-527, bibl. 54, illus.

Of the lamps tested the HNI de Luxe phosphorescent lamp (Osram) had the most favourable emission spectrum, which induced photoactive opening of the stomata without increasing leaf temperature to any great extent and without promoting the hydroactive closing movement. Supplementary illumination during the morning hours appeared to benefit the plants most. No advantage was derived from artificial lighting at mid-day. The experimental plants were lettuce, tomato, hydrangea, cyclamen and tradescantia.—Inst. Bot. tech. Hochsch. Hannover.

Soils and soil amendments.

(*See also* 1727, 2327-2329, 2569, 2916, 3544.)

1703. Ministry of Agriculture, London.
Soil sterilization.
Adv. Leafl. Minist. Agric., Lond. **319**, revised 1960, pp. 8.

By steam and chemicals.

1704. Jacks, H.
Action and property of dry heat in treatment of soil.
Steam heating, an effective method of ensuring good soil disinfection.
Steam treatment of nursery and glasshouse soils.
Fruit and Prod., May 1960, pp. 15, 17-18; June 1960, pp. 15, 17-18; and August 1960, pp. 19-22.

Various methods and equipment described.

1705. Ozawa, H., Tobe, Y., and Suyama, N.
Experiment on soil fumigation with methyl bromide. No. 4. 1. Determination of the minimum dosage required to kill soil nematodes. 2. Dispersal of the methyl bromide gas injected into the soil. [Japanese, with English summary ½ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 65-70, bibl. 6, illus.

During fumigation by the "dosage point method" the concentration of gas decreased as the distance from the dosage point increased and no changes in concentration were observed 5, 29 or 53 hours after treatment. The required dosage by this method was 18 kg./10 are, but only 4·5 kg./10 are was required when the "divided injection method" was used. When more than 150 g. methyl bromide was injected into the soil at a single point, the concentration around the dosage point was so high, even 72 hours after the vinyl sheet had been removed, that planting had to be delayed until the ground had been tilled to avoid plant injury. It is therefore considered safer and more economical to use the "divided injection method" than the "dosage point method". [For No. 3, see *H.A.*, 29: 3493.]

1706. Young, N. M.
Possibilities of peat under glass.
Comm. Gr, 1960, No. 3383, pp. 959-63, illus.

For the improvement of soil structure, use in composts, soilless culture, and for plunging pots.

1707. Booth, E.
A cheap soil conditioner.
Grower, 1960, **54**: 1045-7, bibl. 10.

A review of the benefits of seaweed as a manure.

Nutrition.

(*See also* 1813, 1861, 2331, 2545, 2585, 2677, 3129, 3544, 3549.)

1708. Wallace, A.
Plant analysis as an index of the mineral nutrient status of crops.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 3-10, bibl. 32.

A review.

1709. Wallace, A.
Cation exchange and its possible effects in plant nutrition.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 15-23, bibl. 38.

A review of work on root C.E.C. in terms of relative cation uptake and the metabolic processes by which salts are accumulated.

1710. Hewitt, E. J., and Tatham, P.
Interaction of mineral deficiency and nitrogen source on acid phosphatase activity in leaf extracts.
J. exp. Bot., 1960, **11**: 367-76, bibl. 24.

When tomato, tobacco, cauliflower, mustard, spinach and lettuce plants were grown in sand culture, acid phosphatase activity increased 7–18-fold when P was deficient and NO_3, NO_2 or NH_4 were used as N sources. Zn deficiency with NO_2 or NH_4, and Cu deficiency with NO_2 gave 4–8-fold increases. Deficiency of Zn with NO_3, of B with all N sources, of Mn and Fe with NO_2, and of Mo with NO_2 and NO_3 and to a lesser extent with NH_4, all gave 2–3-fold increases.—Long Ashton Res. Stat.

1711. AMBERGER, A.
Einfluss verschiedener Ernährung und anderer Wachstumsfaktoren auf die Aktivität der Oxydationsenzyme in Pflanzen. (**The effect of different nutrient supply and other growth factors on the activity of the oxidizing enzymes in plants.**) [English and French summaries $\frac{1}{2}$ p. and 1 p.]
Qual. Plant Mater. Veg., 1960, **7**: 249-72, bibl. 75.

Among the plants studied were french beans and peas; the oxidizing enzymes examined were ascorbic acid oxidase, cytochrome oxidase, phenol oxidase, peroxidase and catalase. Increasing the K dosage reduced enzyme activity and raised dry matter contents until at a very high dosage this action was reversed. Both N and P increased enzyme activity and yields. With B high enzyme activity and low dry matter content were both associated with deficiency and toxicity levels. Increasing the Fe dosage led to a rise in both dry matter content and enzyme activity, whereas F depressed yields and raised enzyme activity. Lack of water increased respiration. Light inhibited all enzyme activity.—Agrikulturchem. Inst., Weihenstephan.

1712. EMMERT, F. H.
Quantitative measurement of phosphorus-32 passage from the root milieu to the xylem.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): v.

In beans P^{32} was detected in the stem as early as 2 to 4 min. after exposure of the root to the isotope. P^{32} concentration in the xylem was considerably less than in the external solution.—Univ. Conn., Storrs.

1713. BAUDET, J., DUCET, G., AND COÏC, Y.
Absorption et répartition du phosphore dans la cellule foliaire chez des plantes saines et des plantes carencées en phosphore. Influence de la lumière. (**Effect of light on the absorption and distribution of phosphorus in the leaf cell of healthy and phosphorus-deficient plants.**)
Ann. Physiol. vég., 1959, **1**: 323-39, bibl. 3.

Trials on Marmande tomatoes grown in soil or in sand culture showed that (1) in normal and P-deficient plants the absorption of phosphates is greater in light than in darkness, the renewal of P in the different cell fractions is more intensive in light than in darkness and is more rapid in the fractions corresponding to the chloroplasts and the mitochondria than in those corresponding to the microsomes, and that (2) in P-deficient plants the proportion of P in the cytoplasm and the vascular contents is lower than in normal plants, and after phosphate has been supplied the absorption and incorporation of P are more intensive than in normal plants.—Stat. cent. Phys. vég., Versailles.

1714. JEFFREYS, R. A.
Preliminary study of loss of accumulated K^{42} from roots.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, p. 92.

Young bean plants were pre-treated with $K^{42}HCO_3$ and then placed in $CaCl_2$ for 1 hour before washing. Further treatment with boiling chloroform and various solvents removed further quantities of K^{42}, thereby indicating that $CaCl_2$ did not effect complete removal of free or exchangeable K^{42}.

1715. ŠKOL'NIK, M. JA.
The physiological role of micronutrients in plants. [Russian, with English summary $\frac{1}{3}$ p.]
Izv. Akad. Nauk SSSR, Ser. biol., 1960, No. 5, pp. 686-706, bibl. 6 pp.

A review of Russian and foreign literature, with special reference to the relationship between micronutrients and enzyme activity.

1716. NEALES, T. F.
Some effects of boron on root growth.
Aust. J. biol. Sci., 1960, **13**: 232-48, bibl. 41, illus.

Absence of B in the root environment reduced the linear growth of the radicles of the 5 plant species tested, including broad bean and pea. The minimum B requirement for unrestricted growth of the radicle of *Vicia faba* var. *minor* over 120 hr. was 0·005 p.p.m. There was little movement of B from either seed to radicle or from epicotyl to radicle tip. Results suggest that B is concerned in the orderly regulation of differentiation and lignification in the radicle. Irradiation causes naturally occurring ^{10}B and ^{11}B to emit ionizing radiation.—Univ. Melbourne.

1717. DEKOCK, P. C., AND OTHERS.
Interrelationships of catalase, peroxidase, hematin, and chlorophyll.
Plant Physiol., 1960, **35**: 599-604, bibl. 31.

In mustard peroxidase activity showed only small variations between chlorotic and green leaves, whereas catalase activity was several times greater in green than in chlorotic leaves. A linear relationship of 60 : 1 between chlorophyll and haematin was found. [From authors' summary.]—Macaulay Inst. Soil Res., Aberdeen.

1718. OERTLI, J. J., AND JACOBSON, L.
Some quantitative considerations in iron nutrition of higher plants.
Plant Physiol., 1960, **35**: 683-8, bibl. 19.

Various plants including pea, tobacco and tomato were grown in nutrient culture solutions at different levels of Fe. Although the Fe was maintained in sufficient absolute quantities at low concentrations, the plants showed symptoms of Fe deficiency, thus indicating the existence of a minimum required concentration for adequate plant growth. This minimum concentration is far higher than the thermodynamically possible saturation concentration over practically all of the pH range; hence the uptake of Fe in soils must occur other than from sparingly soluble ionic Fe. It was shown that the minimum concentration depended on the plant species, the form of Fe supplied and the ratio to other nutrients. It appears, however, that the metabolic or internal requirement for Fe in plants, as judged by the iron-chlorophyll relationships, is mostly independent of the species, form of Fe and ratio to other nutrients. Iron deficient plants take up a relatively smaller amount of anions (nitrate) than cations. This may be interpreted as evidence for a function of Fe in N metabolism. [From authors' summary.]—Univ. Calif., Berkeley.

1719. MARSH, H. V., AND EVANS, H. J.
Investigations on the role of iron in chlorophyll metabolism.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxiii-xxiv.

Direct spectroscopic examination of both normal and Fe-deficient pea leaves revealed that the concentration of "b" type cytochromes is much higher in normal than in Fe-deficient leaves. A method has been developed for the quantitative estimation of the protoheme content of leaves, and it was found that mature normal green leaves contain at least 10 times as much protoheme as do chlorotic leaves. Fe-deficiency resulted in a reduction of the protein content of mature but not of immature leaves.—N.C. St. Coll., Raleigh.

1720. BROWN, J. C., TIFFIN, L. O., AND HOLMES, R. S.
Reductive capacity of roots and competition between chelating agents and roots as factors affecting the absorption of iron by plant species.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxiv.

In vitro experiments demonstrated a competition for Fe between the 4 different chelating agents used. *In vivo* experiments showed that roots react like chelating agents in competing for Fe in the growth medium. Plant species differed in their capacity to absorb Fe from the chelates. [See also *H.A.*, 31: 51.]—U.S.D.A., Beltsville, Md.

1721. WALLACE, A.
Possibilities for the use of metal chelates as micronutrient sources.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 99-103, bibl. 10.

A short review of the factors to be considered [see also *H.A.*, 28: 440].

1722. REEKER, R.
Die Verhütung des Molybdänmangels bei Verwendung von Torf als Substrat. **(The prevention of molybdenum deficiency by using peat as a growing medium.)** [English and French summaries $\frac{1}{2}$ p. each.]
Gartenbauwiss., 1959, **24**: 528-45, bibl. 27, illus.

Sphagnum peat was used as the sole medium for lettuce, cauliflower, tomato, *Primula obconica*, snapdragon and zinnia, with graduated applications of Mo added. For most plants the supply of 2 mg. of ammonium or sodium molybdate per litre of peat proved adequate. If the Mo content of the peat sufficed, the percentage of total Mo absorbed by the plants remained constant and small; otherwise the percentage absorbed increased with the degree of Mo deficiency of the medium. It appears that Mo deficiency symptoms are more severe in winter than in summer.—Versuchsgärtn. Torfforsch. G.m.b.H., Bad Zwischenahn.

1723. WALLACE, A.
Preliminary studies on effects of salts and chelating agents on Sr^{89} and Sr^{85} accumulation by plants.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 82-91.

Experiments using bush beans are described, from which the author draws the following tentative conclusions: "H^+ ion was a potent inhibitor of Sr^{85} accumulation. Phosphorus had no effect on Sr^{85} accumulation at acid pH values. Actually low P resulted in less Sr accumulation. The omission of Ca resulted in a large accumulation of Sr^{85} in roots with much less effect in tops. The chelate FeEDDHA was of little consequence in influencing Sr^{85} accumulation in single salt nutrient solutions with $CaCl_2$. In complete nutrient solutions it seemed to have a 25–30% depressing effect. The presence of Ca, HCO_3^-, and high levels of P in nutrient solutions resulted in depressed Sr^{85} in plants, partly as the result of precipitation in the nutrient solution. High P resulted in high root accumulation of Sr^{85} in some cases. High pH solutions in which there was no Sr precipitation tended to result in high amounts of Sr^{85} in roots. An iron chelate inhibited Sr^{85} accumulation from a Ca + Mg solution. No consistent effects of NH_4^+ were noted on Sr^{85} accumulation except for large increases under some conditions. From two to three times as much Sr^{85} was accumulated by bush beans from a 0·002 N solution of CaEDTA as from either 0·002 N $CaCl_2$ or $Ca(NO_3)_2$. High pH solutions, even with complete nutrients, tended to result in high Sr accumulation if there was no precipitation in the nutrient solutions." The results of an exploratory experiment are also tabulated, which showed that sodium salts of some chelating agents increased Sr^{89} accumulation, while the salts of other agents tended to reduce accumulation.

1724. Jeffreys, R. A.
Preliminary studies of the effect of pretreatment with NH_4^+ and HCO_3^- on uptake of Sr^{85} from Cl^- and HCO_3^- solutions.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 91-2.

An experiment using bush beans is described. Pretreatment with NH_4^+ tended to increase root accumulation of Sr^{85}. $NaHCO_3$ also resulted in increased accumulation but in decreased translocation from the roots.

1725. Caldwell, J. L., and Kiplinger, D. C.
Injecting fertilizer in water line correlates to growth rate.
Flor. Exch., 1960, **135**(4): 10-11.

Two types of apparatus, available in the U.S.A., for the injection of nutrients into glasshouse irrigation systems are described, and the use of such injectors is discussed. The best results with several flower crops were obtained by using 1 oz. of a 20 : 20 : 20 or 25 : 5 : 20 fertilizer in 10 gal. (i.e., 148 and 185 p.p.m. of N).—Ohio St. Univ.

1726. Fiščenko, G. I.
A new method of effective utilization of waste water from towns and industry. [Russian.]
Zemledelie, 1960, **8**(8): 75-81, illus.

Sewage water which contains appreciable amounts of N, P and K is piped to a hydrant on the edge of the field whence, *via* a 200 m. long hose wound round a large rotating reel surrounding the tractor, it is applied to trenches 30 cm. deep cut by 5 coulters on the tractor. Clean water, with or without fertilizers, can also be applied by this method of sub-surface irrigation. The installation is expensive but the system proved economical for the crops tested, including cabbage.

1727. de Groote, R.
La valeur nutritive et biologique de quelques fumiers artificiels et amendements organiques. Possibilités d'applications en horticulture. **(The nutritive and biological value of some artificial manures and organic amendments. Possible horticultural applications.)**
Bull. hort., Liège, 1960, **15**: 352-8.

Notes on the composition and properties of some organic waste materials used as manures and some soil conditioners.

Soilless culture.

(*See also* 1706, 1722, 2558, 2684, 2950, 3575.)

1728. Favilli, R.
Su di un nuovo tipo di impianto idroponico per subirrigazione a vasca unica con alimentazione centrale. **(A new type of hydroponic installation for sub-irrigation by a single tank with central feeding.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 277-86, bibl. 1, illus.

A full description is given of the construction of a tank, 50 × 10 m. in area and 45 cm. high, of conglomerate, bricks and cement, occupying the entire floor of a glasshouse. The junctions of walls and floor are rounded, the floor slopes very slightly from the ends to the centre, and the interior is lined with 2 superposed sheets of polythene film. A channel for running in and draining off the nutrient solution crosses the centre of the floor, and vertical partitions immediately over its sides reach down to within 6 cm. of the floor. The solution thus passes through the 2 gaps to and from the substrate on either side of the channel, and a row of short tile-drain tubes side by side perpendicular to the channel on either side facilitates the influx and outflow. There are 3 longitudinal tile drains. The substrate is a slightly calcareous gravel and the solution is warmed before use. Early tomatoes have been grown very successfully in one of these hydroponic houses.—Ist. Agron. gen., Univ. Pisa.

1729. Göhler, F.
Arbeitsanleitung für die chemische Schnelluntersuchung und die Ergänzung von Nährlösungen der erdelosen Kultur im Produktionsbetrieb. **(Working instructions on the rapid testing of nutrient solutions and their supplementation in a commercial soilless culture installation.)**
Arch. Gartenb., 1960, **8**: 419-31, illus.

Quick tests worked out at Grossbeeren.

1730. Göhler, F.
Neue Ergebnisse über die Kontrolle und Ergänzung von Nährlösungen bei der erdelosen Kultur. **(New results on the checking and supplementation of nutrient solutions in soilless culture.)**
Dtsch. Gartenb., 1960, **7**: 246-7, bibl. 4.

For cucumbers, tomatoes and lettuces and for the raising of cucumber and tomato plants.

Tissue culture.

(*See also* 1784, 1787, 1857, 2428, 2708.)

1731. Jones, L. E., and others.
Growth of somatic tobacco cells in microculture.
Amer. J. Bot., 1960, **47**: 468-75, bibl. 24, illus.

Observations on single cells or small groups of cells from a culture of a *N. tabacum* × *N. glutinosa* hybrid, which grew for longer than 4 months in a droplet of medium surrounded by mineral oil.—Ore. St. Coll., Corvallis, and Univ. Wis., Madison.

1732. DURANTON, H.

Évolution des acides aminés libres dans des fragments de tubercules de topinambour cultivés *in-vitro*. **(The evolution of free amino acids in fragments of Jerusalem artichoke tuber cultured *in vitro*.)**

Ann. Physiol. vég., 1959, **1**: 273-94, bibl. 15.

During culture arginine, the principal free amino acid, rapidly disappeared, giving place to considerable quantities of proline, hydroxyproline, glutamic acid, amides and alanine. [See also *H.A.*, 30: 5360 and 5361.]—Stat. cent. Phys. vég., Versailles.

Physiology and metabolism.

(*See also* 2457, 2458, 2461, 2462, 2466, 2467, 2483, 2484, 2582, 2583, 2622, 2649, 2707, 2719, 2721, 2901, 2911, 2912, 2933, 2978, 2979, 3393, 3480, 3531, 3545, 3551-3553, 3564.)

1733. GAASTRA, P.

Photosynthesis of crop plants as influenced by light, carbon dioxide, temperature, and stomatal diffusion resistance. [Dutch summary 2 pp.]

Meded. LandbHogesch., Wageningen, 1959, **59**(13): 1-68, bibl. 100, illus.

Measurements of photosynthetic activity were made on several crop plants including cucumber, tomato, spinach and turnip. Among the results obtained it was shown that with light saturation and normal CO_2 concentrations the rate of diffusion determines the rate of photosynthesis; the stomatal control, however, depends on the relationship between stomatal resistance and the sum of the resistances in the external air, the stomata and the mesophyll cells. Variation in the value of the ratio was mainly due to variation in mesophyll resistance, and this may be an important character indicating the cropping potential of a crop. Transpiration was more dependent than photosynthesis on stomatal condition.— Lab. Plant physiol. Res., Wageningen.

1734. MOHR, H., AND PETERS, E.

Der Phototropismus und das lichtabhängige Längenwachstum des Hypokotyls von *Sinapis alba* L. **(Phototropism and the influence of light on the extension growth of the hypocotyl of white mustard.)** [English summary ½ p.]

Planta, 1960, **55**: 637-46, bibl. 21, illus.

It was found that no curvature of the hypocotyl occurred with unilateral light at the longer wavelengths, in spite of the fact that a steep gradient of radiation existed within the tissues between the illuminated and the shaded sides. Lengthening of the hypocotyl was mostly controlled by the longer wavelengths, whereas a phototropic curvature of the hypocotyl could only be induced by the shorter wavelengths of visible light. A hypothesis based on the effect of light on endogenous gibberellins is postulated.— Univ. Tübingen.

1735. BORTHWICK, H. A., AND HENDRICKS, S. B.

Photoperiodism in plants.

Science, 1960, **132**: 1223-8, bibl. 18, illus.

A review dealing with the physiology of phytochrome action including the measurement of time, and with the detection of phytochrome by differential spectrophotometry.—U.S.D.A., Beltsville, Md.

1736. BOGORAD, L., AND MCILRATH, W. J.

Effect of light quality on axillary bud development in *Xanthium*.

From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxxii.

A red—far-red reversible light system appears to control axillary bud development, which can be repressed by exposure to light of approximately 7,300Å during the last 2 hr. of a 20-hr. photoperiod. Leaves approximately 20 mm. in length were the photoreceptors for axillary bud development, but leaves 30 mm. and over were the most effective receptors for floral induction.—Univ. Chicago.

1737. KHUDAIRI, A. K.

Effect of streptomycin on the flowering of two *Xanthium* species.

Physiol. Plant., 1960, **13**: 1-8, bibl. 15, illus.

Leaves of *Xanthium* which had been bleached by spraying with 0·2% streptomycin solution were not able to function as receptors of photoperiodic treatment that would normally initiate flowering.—Univ. Baghdad, Iraq.

1738. ENGELMANN, W.

Endogene Rhythmik und photoperiodische Blühinduktion bei *Kalanchoe*. **(Endogenous rhythm and photoperiodic flower induction in *Kalanchoe*.)** [English summary ½ p.]

Planta, 1960, **55**: 496-511, bibl. 34, illus.

A more detailed version of an earlier report [see *H.A.*, 31: 72].

1739. SEARLE, N. E.

Persistence and transport of the flowering stimulus in *Xanthium* growing at constant temperature under continuous light.

From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxxiii.

No well defined rhythm in the flowering response was observed, and hence it is concluded that endogenous diurnal rhythms are not involved in the biochemical reactions of flower initiation.—E. I. du Pont de Nemours and Co., Wilmington, Delaware.

1740. Rylska, T.
Rola skracania sie lub wydłuzania dnia przy indukcji fotoperiodyzcnej rośliny krótkiego dnia *Perilla ocimoides* L. **(The influence of the shortening or lengthening of the day on the photoperiodic induction of the short-day plant *Perilla ocymoides* L.)** [English summary.]
Acta Soc. Bot. Polon., 1959, **28**(1): 65-74, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 30,110.

The direction of photoperiodic induction was determined by the absolute length of light and dark periods during a 24-hour cycle and not by day length. Differences between the response of plants in the spring and in the autumn appeared to be due to factors other than changing day length. Plants subjected to lengthening days showed a slight superiority in induction.

1741. Raghavan, V., and Jacobs, W. P.
Floral induction in cultured apical buds of *Perilla.*
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxxii.

Photoinduced apical buds growing in culture medium under long-day conditions took much longer to show apical floral development than buds growing under short days. Buds with 1 or 2 pairs of mature leaves showed earlier floral initiation under short days, but under long days they remained vegetative. When photoinduced buds and mature leaves were grown separately in the same medium, the buds did not show floral development. Addition of IAA to the medium inhibited the development of buds, but buds with 2 pairs of leaves attached flowered at all concentrations of IAA.—Princeton Univ., N.J.

1742. Čajlahjan, M. H.
Regularities of ontogenesis and the physiology of flowering in higher plants. [Russian, with English summary 1 p.]
Izv. Akad. Nauk SSSR, Ser. biol., 1960, No. 2, pp. 206-29, bibl. 3 pp., illus.

Work with the long-day plant *Rudbeckia bicolor* and the short-day *Perilla nankinensis* showed that the change from vegetative growth to flowering required increased carbohydrate metabolism in the long-day species and increased nitrogen metabolism in the short-day species. The decisive role in the first case was played by gibberellins and auxins and in the second by certain highly specialized products of nucleic acid metabolism including anthesins.

1743. Lam, S. L., and Leopold, A. C.
Reversion from flowering to the vegetative state in *Xanthium.*
Amer. J. Bot., 1960, **47**: 256-9, bibl. 7, illus.

Plants of *Xanthium pennsylvanicum*, which had been induced to flower by short photoperiods, reverted to the vegetative state after decapitation or pinching and subsequent partial disbudding.—Purdue Univ., Lafayette.

1744. Šul'gin, I. A., Hazanov, V. S., and Klešnin, A. F.
On the reflection of light from leaves and its relation to leaf structure. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **134**: 471-4, bibl. 13.

The reflecting properties of the leaves of a number of ornamental mesophytes and xerophytes were examined with a goniometer to measure the changes in the percentage of light reflected at different angles. The thickness and nature of the surface of the leaf were found to determine its reflecting properties. Data are presented graphically. [See also *H.A.*, 30: 46 and 4707, and 31: 69.]

1745. Canny, M. J., and Markus, K.
The metabolism of phloem isolated from grapevine.
Aust. J. biol. Sci., 1960, **13**: 292-9, bibl. 13, illus.

Measurements in phloem tissue of the respiration rate, the permeability of the tissue to sucrose, and the rate of sucrose synthesis from glucose and fructose showed that these activities were not very different from those of other plant tissues, as reported in the literature.—I.C.I.A.N.Z., Ascot Vale, Vict.

1746. Zimmermann, M. H.
Movement of organic substances in trees.
Science, 1961, **133**: 73-9, bibl. 39, illus.

A review dealing with phloem structure, the significance of callose, the nature of sieve-tube substances and the physiology of translocation.

1747. Biddulph, O., and Cory, R.
Demonstration of two translocation mechanisms in studies of bidirectional movement.
Plant Physiol., 1960, **35**: 689-95, bibl. 6, illus.

By applying $C^{14}O_2$ to the lowermost trifoliate leaf on the stem of a bean plant, and P^{32} to the next higher leaf, the simultaneous bidirectional movement of the two tracers through the phloem bundles in the included internode was studied. To do this the bark was removed, quickly frozen, and dried in vacuo. Radioautograms were prepared showing the distribution of both tracers, and of P^{32} alone, by using a filter. Then after the decay of the P^{32} a C^{14} radioautogram was prepared. Two distinctly different patterns of bidirectional movement were found which were sufficiently distinctive to require production by different mechanisms. The first pattern fits the characteristics of a pressure flow mechanism ideally; the second pattern requires an activated mechanism such as protoplasmic streaming. [From authors' summary.]—Wash. St. Univ., Pullman.

1748. Turner, E. R.
Movements of organic nitrogen and carbohydrates in *Pelargonium* plants.
Ann. Bot., Lond., 1960, **24**: 382-6, bibl. 13.

Evidence has been obtained suggesting that the movement of organic N in the phloem is independent of carbohydrate movement, and thus cannot be explained by the mass-flow theory.—Chelsea Coll. Sci. Technol.

1749. Turner, E. R.
The movement of organic nitrogen compounds in plants.
Ann. Bot., Lond., 1960, **24**: 387-96, bibl. 19.

The hypothesis that the movement of organic N, like that of carbohydrate, is governed by the prevailing concentration gradients for the mobile compounds in the phloem has been tested by determining the effect on N distribution when normal translocation was interrupted by ringing in *Pelargonium* spp. and *Vicia faba* plants. N compounds in the plant tissue were fractionated into protein, soluble protein, amide, amino-acid, peptide, nitrate and ammonia nitrogen. Results showed that accumulation above the ringed zone was confined to the soluble N fractions and that amino-acids, and possibly peptides, were involved in translocation. The direction of movement may be determined by the prevailing concentration gradients of these compounds in the phloem tissue. [From author's summary.]—Chelsea Coll. Sci. Technol.

1750. Fewson, C. A., and Nicholas, D. J. D.
Utilization of nitric oxide by micro-organisms and higher plants.
Nature, 1960, **188**: 794-6, bibl. 29.

Marrow, strawberry, cauliflower and broad bean featured in the experiments here described, which indicated that nitric oxide is an intermediate in both assimilatory and dissimilatory nitrate reduction.—Long Ashton Res. Stat., Bristol.

1751. Hewitt, E. J., and Notton, B. A.
Estimation and distribution of some phosphorus fractions in leaves of plants.
J. Sci. Food Agric., 1960, **11**: 653-8, bibl. 8.

The procedure is described and data are given on the distribution, including seasonal variation, of inorganic and organic P in the leaves of tomato, cauliflower, mustard and vegetable marrow.

1752. Ducet, G., and Vandewalle, G.
Phosphorylation oxydative par les mitochondries de feuilles et de racines. II. Mitochondries de racines. (**Oxidative phosphorylation by leaf and root mitochondria. II. Root mitochondria.**)
Ann. Physiol. vég., 1959, **1**: 313-22, bibl. 14.

Pea root mitochondria oxidized succinate and esterified mineral P. [For part I see *H.A.*, 30: 4771.]

1753. Bendall, D. S., Ranson, S. L., and Walker, D. A.
Effects of carbon dioxide on the oxidation of succinate and reduced diphosphopyridine nucleotide by *Ricinus* mitochondria.
Biochem. J., 1960, **76**: 221-5, bibl. 12.

In castor bean mitochondria succinic-cytochrome c reductase was markedly inhibited by relatively low concentrations of carbon dioxide. DPNH-cytochrome c reductase was inhibited by high concentrations of sodium bicarbonate and other salts.

1754. Ranson, S. L., Walker, D. A., and Clarke, I. D.
Effects of carbon dioxide on mitochondrial enzymes of *Ricinus*.
Biochem. J., 1960, **76**: 216-21, bibl. 21.

Mitochondrial fractions were separated from the endosperms of castor beans that had been germinating for 4 days. Concentrations of carbon dioxide of 10% or more inhibited succinic oxidase, and the conversion of pyruvate into Krebs cycle acids was also depressed at higher concentrations.—King's Coll., Newcastle.

1755. Dalgarno, L., and Hird, F. J. R.
Increase in the process of accumulation of amino acids in carrot slices with prolonged aerobic washing.
Biochem. J., 1960, **76**: 209-15, bibl. 16.

An increase in salt-stimulated respiration and in the accumulation of amino acids during aerobic circulation of peeled carrot root slices is thought to be related to the removal of endogenous substances from the cytoplasm or carrier sites or from both, and can be reversed by anaerobic circulation.—Univ. Melbourne.

1756. Gerola, F. M.
Azione della luce sullo sviluppo e la differenziazione dei plastidi di pisello. (**The action of light on the development and differentiation of plastids in pea plants.**)
Nuovo G. bot. ital., 1959, **66**: 506-8, bibl. 4, illus.

In meristematic tissues of pea seedlings the pro-plastids fairly closely resembled mitochondria, but the former enlarged and differentiated as the leaves formed. In etiolated leaves an accumulation of minute vacuoles in each pro-plastid formed a "pro-lamellar body". In normally illuminated leaves this did not occur, but the whole pro-plastid developed a typically lamellar structure at an early stage, and the cohesion of the lamellae at various points resulted in the formation of granules.—Univ. Milan.

1757. Price, L., and Klein, W. H.
Chlorophyll synthesis in X-irradiated etiolated bean leaf tissue.
From abstr. in *Plant Physiol.*, 1960, **35**, (Suppl.): ix.

1758. Biebl, R.
Strahlenempfindliche Entwicklungsstadien. **(Developmental stages sensitive to radiation.)**
Ber. dtsch. bot. Ges., 1959, **72**: 202-11, illus., from *Biol. Abstr.*, *Sect. D*, 1960, **35**, Abstr. 32,824.

Cuttings of *Tradescantia* and related species were subjected to different doses of X-rays at various stages after cutting, and the development of root initials was followed. Inhibition was much less effective when irradiation occurred at a time when the root initials were about to emerge. Shoot formation continued after irradiation treatment which caused complete inhibition of root development. Inhibition did not operate through a decrease in the growth substance content.

1759. Lieberman, M., and Craft, C. C.
Ethylene production by cytoplasmic particles from apple and tomato fruits in the presence of thiomalic and thioglycolic acid.
Nature, 1961, **189**: 243, bibl. 5.

The results of several experiments are reported. The ethylene-producing systems resemble enzymatic processes; the rate of ethylene production in the presence of either acid was proportional to the concentration of the cytoplasmic particles and, within limits, to the length of incubation. The reaction was stimulated by phosphate but inhibited by heat denaturation and by certain chelating agents. These findings offer a new approach to the study of ethylene biosynthesis.—U.S. Dep. Agric. Plant Ind. Stat., Beltsville, Md.

1760. Bernstein, L., and Nieman, R. H.
Apparent free space of plant roots.
Plant Physiol., 1960, **35**: 589-98, bibl. 27.

Histological data for a number of plants including peas and beans.

1761. Lamport, D. T. A., and Northcote, D. H.
Hydroxyproline in primary cell walls of higher plants.
Nature, 1960, **188**: 665-6, bibl. 13.

Evidence for the occurrence of protein containing hydroxyproline in cell walls of sycamore and bean.

1762. Cocking, E. C.
Some effects of chelating agents on roots of tomato seedlings.
Biochem. J., 1960, **76**: 51P-52P, bibl. 4.

Separation of the cells of the root occurred as a result of treatment with sterile solutions of EDTA at pH 7·2 but not at 4·5, confirming that separation is largely dependent on the chelation by EDTA of Ca^{2+} of the middle lamella [see *H.A.*, 28: 1081h].—Univ. Nottingham.

1763. Kreeb, K.
Über die gravimetrische Methode zur Bestimmung der Saugspannung und das Problem des negativen Turgors. I. Mitteilung. **(The gravimetric method of determining suction pressure and the problem of negative turgor. I.)**
Planta, 1960, **55**: 274-82, bibl. 13, illus.

R. O. Slatyer's method of determining suction pressure [*Aust. J. biol. Sci.*, 1958, **2**: 349-65] was improved and exact values were obtained. Under laboratory conditions wilting leaves of *Buxus sempervirens* were still able to recover after a negative turgor pressure of 65 atm. was recorded at a suction pressure of 130 atm. *Hedera helix* leaves could not recover if the suction pressure exceeded an osmotic value of 25 atm.—Bot. Inst. landw. Hochsch., Stuttgart-Hohenheim.

Growth substances.

(*See also* 1734, 1741, 1742, 2066, 2115, 2132, 2136-2139, 2388, 2397, 2398, 2404, 2429, 2430, 2438, 2444, 2450, 2460, 2461, 2480-2482, 2538, 2586, 2588-2591, 2620, 2653, 2670, 2704, 2706, 2708, 2779, 2817, 2818, 2861, 2884, 2885, 2902, 2903, 3038, 3119, 3221, 3244, 3262, 3351, 3366, 3367, 3488, 3595.)

1764. Marrè, E.
Sulla regolazione della crescita nelle piante superiori. **(Growth regulation in higher plants.)** [English summary ¼ p.]
Nuovo G. bot. ital., 1959, **66**: 641-93, bibl. 74, illus.

A review, one of the principal plants mentioned being the pea.

1765. Thompson, P. A.
Direct transmission of a growth-promoting substance from strawberry to pea.
Nature, 1960, **188**: 682-3, bibl. 5.

Experiments are described in which the blanched epicotyls of peas were approach-grafted to strawberry petioles after pre-treatment of the strawberries with GA and by winter chilling. The experiments showed that peas respond by increased internode length when grafted onto petioles of strawberry leaves; that the response is increased when the strawberries have been previously treated with GA; that the responses of different varieties of pea to grafting are similar to their responses to treatment with GA; and that chilled strawberry plants, in which there may be endogenous gibberellins, promote a greater response than do unchilled plants in which endogenous gibberellins may be low.—Scot. hort. Res. Inst., Mylnefield, Invergowrie.

1766. Penner, J.
Über den Einfluss von Gibberellin auf die photoperiodisch bedingten Blühvorgänge bei *Bryophyllum*. (**The influence of gibberellin on photoperiodic flower induction in *Bryophyllum*.**)
Planta, 1960, **55**: 542-72, bibl. 27, illus.

The "long-short-day" plants *Bryophyllum daigremontianum*, *B. crenatum* and *B. tubiflorum* were treated with various photoperiods and with gibberellin. It was observed that GA could replace long days as a flower-inducing stimulus. Insufficiency of either GA or the required photoperiod resulted in phyllodic inflorescences. Short days could in no case be replaced by GA, although under certain conditions an insufficient short-day photoperiod could be supplemented with GA. If the plant had received a maximum flowering stimulus, then additional GA had no effect. [For earlier work see *H.A.*, 30: 3175.]—Univ. Göttingen.

1767. Downs, R. J., and Cathey, H. M.
Effects of light, gibberellin, and a quaternary ammonium compound on the growth of dark-grown red kidney beans.
Bot. Gaz., 1960, **121**: 233-7, bibl. 18.

The beans were grown in darkness except for brief exposures to red light. Internodes did not elongate appreciably until the elongation of the preceding internode was nearly completed. There was no apparent interaction between the responses to GA and light if a single internode was used as a measure of the response. The action of AMO-1618 appeared to be interrelated with that of GA, but not with the photoreaction. The retardation induced by AMO-1618 was equally great on red-irradiated and dark-grown plants.—Plant Industry Stat., Beltsville, Md.

1768. Moffatt, J. S., and Radley, M.
Gibberellic acid. XI. The growth-promoting activities of some functional derivatives of gibberellic acid.
J. Sci. Food Agric., 1960, **11**: 386-90, bibl. 7.

Eleven salts and 4 acyl derivatives of GA showed activities similar to that of GA when applied to the roots or to the leaves of dwarf pea seedlings. Five esters and 9 acyl derivatives of esters showed no activity when applied to the leaves; most of them were moderately active when applied in aqueous culture solutions to the roots. [From authors' abstract.]—I.C.I. Ltd., Akers Res. Labs, Welwyn, Herts.

1769. Brian, P. W., and Hemming, H. G.
Promotion of cucumber hypocotyl growth by two new gibberellins.
Nature, 1961, **189**: 74, bibl. 7.

An experiment is described in which gibberellins A_4 and A_7 were found to be more effective than GA in promoting cucumber hypocotyl growth; A_7 was also found to be as effective as GA in promoting lettuce hypocotyl growth but less so in promoting pea stem extension. In another experiment gibberellin A_9 was found also to be more active than GA as regards cucumber hypocotyl growth, but much less active as regards pea stem or lettuce hypocotyl growth. Gibberellins A_4, A_7 and A_9 have a structural feature in common which distinguishes them from A_1 and GA, viz., the absence of a hydroxyl group at position 7.—I.C.I. Ltd., Welwyn, Herts.

1770. Yoda, S., and Ashida, J.
Effect of growth substances on the osmotic value of pea stem sections.
Nature, 1960, **188**: 600-1, bibl. 7.

Gibberellin and indole-3-acetic acid were applied in solution and as lanolin pastes. Sections treated with IAA absorbed more water than the control, whereas those treated with GA did not. It is suggested that the former causes anatonosis and the latter catatonosis and that this explains the elongating effect of IAA on the cell wall but not the mechanism of the action of GA.—Kyoto Univ.

1771. Wittwer, S. H., and Tolbert, N. E.
Comparative growth, flowering, and fruiting responses induced by 3-indoleacetic acid, gibberellin, and 2-chloroethyltrimethylammonium chloride.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxxv.

Vegetative and reproductive responses in several plants indicated that closely related, yet distinct metabolic systems were involved. In lettuces 2-chloroethyltrimethylammonium chloride suppressed germination induced by gibberellin and light, as well as vegetative extension of genetically dwarf and normal plants, elongation in light and in darkness and flowering. No direct effect of the chloride on the growth of tomato ovaries was found, but in combination with 10^{-3} M IAA and 10^{-5} M GA a synergistic growth rate was induced beyond that which could be ascribed to the IAA-GA interaction.—Mich. St. Univ., East Lansing.

1772. Rossi, G.
Sulla diminuzione di sensibilità alla auxina in internodi di pisello pretrattati con acido indolacetico. (**The reduction of sensitivity to auxin in pea internodes pre-treated with indoleacetic acid.**)
Nuovo G. bot. ital., 1959, **66**: 555-9, bibl. 7.

Pre-treatment of shoot tips of pea seedlings by replacing the growing points with cellulose containing IAA at 5×10^{-5} did not affect the subsequent growth or respiration of internode segments in water, but practically eliminated their sensitivity to a 10^{-4} solution of IAA in respect of growth, whereas the respiration response to this solution was unaffected.—Univ. Milan.

1773. Humphries, E. C., and Maciejewska-Potapczyk, W.

Effects of indoleacetic acid, naphthalene-acetic acid, and kinetin on phosphorus fractions in hypocotyls of dwarf bean (*Phaseolus vulgaris*).

Ann. Bot., Lond., 1960, **24**: 311-16, bibl. 14.

Hypocotyls of 2-week-old plants were placed for 1 week in nutrient solutions containing the growth substances. Subsequent analysis showed that the total P and orthophosphate contents of the hypocotyls were increased by NAA to a greater extent than by IAA; they were unaffected by kinetin. Acid-soluble bound P, representing several different compounds, was increased by NAA and by the higher concentrations of kinetin. Ribonucleic acid phosphorus was greatly increased by NAA alone and slightly inhibited by 1 mg. per 1. of kinetin. Kinetin strongly inhibited the formation of roots in bean hypocotyls, apparently not by inhibiting cell division but by influencing the kind of cell produced.

1774. Wickson, M., and Thimann, K. V.

The antagonism of auxin and kinetin in apical dominance. II. The transport of IAA in pea stems in relation to apical dominance.

Physiol. Plant., 1960, **13**: 539-54, bibl. 15, illus.

The transport of IAA-C^{14} was studied in excised sections. Sections cut from just below the apex transported more IAA-C^{14} in a 3-hour period than did older sections, and sections placed in shallow layers of IAA-C^{14} solution translocated the auxin largely, though not exclusively, in a basipetal direction; acropetal movement occurred both in the stem tissue and in lateral buds. Radioactivity in the tissue could be reduced by exposure to light, by simultaneous treatment with kinetin, or by decapitation of the plants some days before the sections were cut. All of these conditions also favoured bud growth. When stem sections bearing developing lateral buds were treated with IAA-C^{14}, a linear relationship was found between the inhibition thus re-established and the isotope content in the bud tissue. [From authors' summary.—For Part I see *H.A.*, 29: 43.]—Harvard biol. Labs, Cambridge, Mass.

1775. Gautheret, R.

Action de l'acide 2,4-dichlorophenoxy-acétique ou 2,4-D et de la cinetine sur les plantules de *Nicotiana tabacum* L. **(The effect of 2,4-D and of kinetin on seedlings of *Nicotiana tabacum* L.)**

C.R. Acad. Sci. Paris, 1960, **250**(13): 2307-12, bibl. 3, illus.

The joint application of 2,4-D and kinetin caused complex histological phenomena as a result of antagonism or synergy, and also had effects which could not be obtained by application of either compound separately.—*Weed Abstr.*, **9**, No. 1276.

1776. Pallas, J. E., Jr.

Effects of temperature and humidity on foliar absorption and translocation of 2,4-dichlorophenoxyacetic acid and benzoic acid.

Plant Physiol., 1960, **35**: 575-80, bibl. 26, illus.

With increasing temperatures from 20° to 30° C. increased absorption and translocation of both compounds by red kidney beans were found. At temperatures of 20, 25 and 30° C. less 2,4-D or benzoic acid was absorbed and translocated at low humidities (34–48%) than at high humidities (70–74%). The increased absorption and translocation at a higher humidity were correlated with the degree of stomatal opening. The movement of 2,4-D in the leaf, as indicated by radioautograms, was confined in general to the vascular bundles and followed the route of the assimilate stream out of the leaf and into the stem, bud and roots. The benzoate-treated plants showed not only a similar movement out of the leaf but also a diffuse movement away from the treated areas to all parts of the treated leaf. Studies involving extraction of the radioactivity and partitioning in solvents coupled with chromatography showed that the bulk of the radioactivity was being translocated as free 2,4-D and benzoic acid. [From author's summary.]—Univ. Calif., Davis.

1777. McCready, C. C.

Further experiments on the polar transport of phenoxyacetic acids in bean petioles.

Typescript Rep. Pap. read to Soc. exp. Biol., 1960, pp. 16.

From a study of translocation in *Phaseolus vulgaris* petioles the author concluded that: "polar transport of these auxins depends on localized, selective metabolic pumps, between which the auxins move by non-polar diffusion, possibly accelerated by cyclosis".—Dep. Agric., Oxford Univ.—*Weed Abstr.*, **9**, No. 1280.

1778. Fries, N.

The effect of adenine and kinetin on growth and differentiation of *Lupinus*.

Physiol. Plant., 1960, **13**: 468-81, bibl. 8, illus.

The dry matter production of seedlings of *Lupinus hartwegii* var. *roseus* cultivated aseptically in darkness was strongly stimulated by 10^{-4} M adenine and by 10^{-7} M kinetin. At higher concentrations the response was abnormal. In intact seedlings growing in darkness the stimulation resulted in an accelerated growth rate of the shoot and lateral roots, and in a great increase in dry weight of all parts of the plant. Higher concentrations of kinetin inhibited the elongation of the main root, and above certain threshold values the various manifestations of stimulation disappeared. On the other hand, in decotylized seedlings growing in the dark kinetin did not promote the growth of the shoot and lateral roots. Totally illuminated intact seedlings responded very weakly or not at all to kinetin. However, if the root system alone was kept in darkness, kinetin produced a positive effect on all parts of the plant. The striking changes in the morphology of the main root, chiefly due to a differential increase in cell volume of peripheral tissues, are described. [From author's summary.]—Univ. Uppsala.

1779. Forsyth, F. R., and Samborski, D. J.
Effects of kinetin and benzimidazole on the growth of etiolated pea stems and barley coleoptiles.
Canad. J. Bot., 1960, **38**: 875-81, bibl. 12, illus.

Optimum growth of etiolated pea stem sections was obtained in a basal solution of 3-indoleacetic acid, cobalt chloride and sucrose. Benzimidazole at 100 to 200 p.p.m. and kinetin at 1 p.p.m. added to the basal solution inhibited growth of etiolated pea stem sections. Growth of the pea stem sections was inhibited when they were treated for 4 hours with kinetin plus 3-indoleacetic acid, then transferred to the basal solution for 14 hours. There was no growth inhibition when pea stem sections were treated for 4 hours with kinetin alone, followed by 14 hours on the basal solution. Ether and hot water extracts of pea stem tissue pre-treated with kinetin and 3-indoleacetic acid did not appear to contain a growth inhibitor. [From authors' abstract.]—Canada Dep. Agric. Res. Stat., Winnipeg.

1780. Collins, W. T., and Salisbury, F. B.
Antimetabolites and flowering of cocklebur.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxiii.

Compounds which inhibited flowering were applied at various times in relation to a single inductive dark period. Ethionine, picolinic acid, benzimidazole, 2,6-diaminopurine sulphate and quercetin were only effective when applied during the dark period.—Colo. St. Univ., Fort Collins.

1781. Arrigoni, O.
Effetto del solfito sulla crescita e sul metabolismo respiratorio di segmenti di internodio di pisello. **(The effect of sulphite on the growth and respiratory metabolism of segments of pea internode.)** [English summary 4 lines.]
Nuovo G. bot. ital., 1959, **66**: 494-6, bibl. 5.

In the presence of optimal or super-optimal concentrations of auxin, a 3×10^{-5} M solution of sulphite increased growth by 36% and oxygen consumption by 17%. When the auxin was absent, or at sub-optimal concentrations, the sulphite was inactive. At 10^{-3} M it at first inhibited, and later stimulated growth. Metabisulphite and thiosulphite were inactive.—Univ. Milan.

1782. Meyer, A.
Wachstum und oxydative Phosphorylierung. **(Growth and oxidative phosphorylation.)**
Naturwissenschaften, 1960, **47**: 600, bibl. 11.

Experiments on the growth-regulating activities of vitamin K_1 (menadiol) and vitamin K_3 (menadion), using cress, are described. Menadiol and nicotinic acid inhibited growth and germination of the seeds respectively. Vitamin K_1 was shown to possess a growth-inhibiting property which could be reinforced by elithyran, in contrast to vitamin E and thyroidea which have growth-promoting actions.

1783. Pagel, H.
Über den Einfluss von Humusstoffen auf das Pflanzenwachstum. I. Einfluss von Humusstoffen auf Keimung und Wurzelwachstum. **(The effect of humus substances on plant growth. I. The effect of humus substances on germination and root growth.)** [Russian and English summaries about 10 lines each.]
Albrecht-Thaer-Arch., 1960, **4**: 450-68, bibl. 21, illus.

Humic acid did not affect the germination of cress (and wheat) seed as such, but it stimulated or inhibited root growth according to its concentration.—Inst. Bodenk. PflErnähr., Humboldt-Univ., Berlin.

1784. Newcomb, E. H.
Dissociation of the effects of auxin on metabolism and growth of cultured tobacco pith.
Physiol. Plant., 1960, **13**: 459-67, bibl. 6.

1785. Scott, T. K., and Briggs, W. R.
Auxin relationships in the Alaska pea (*Pisum sativum*).
Amer. J. Bot., 1960, **47**: 492-9, bibl. 29, illus.

The distribution of "free" auxin in the 9-day-old Alaska pea epicotyl was determined by short-term ether extraction and by the standard agar diffusion technique. The apical bud appeared to be the only source of "free" auxin. In the upper (growing) internode "free" auxin as determined by diffusion was found to decrease significantly from apex to base, while "free" auxin as determined by extraction remained constant. Below this region, both diffusible and extractable auxin remained constant through one internode and then both decreased simultaneously to the base of the plant. [From authors' summary].—Stanford Univ., Calif.

1786. Kuraishi, S., and Okumura, F. S.
A new green-leaf growth-stimulating factor, phyllococosine, from coconut milk.
Nature, 1961, **189**: 148-9, bibl. 7.

Experiments with leaf disks of radish showed that coconut milk was more active than either kinetin or gibberellin in stimulating leaf growth, and that it had a synergistic action when used in combination with these substances. Details of the extraction from coconut milk of the growth-promoting factor, named "phyllococosine", and of its purification are given.—Univs Tokyo and Tokushima, Japan.

1787. Bertossi, F.
L'acido 3-indolglicolico come regolatore naturale della crescita. **(3-Indoleglycolic acid as a natural growth regulator.)**
Nuovo G. bot. ital., 1959, **66**: 497-505, bibl. 20, illus.

The compound has been isolated from cabbage and spinach, and has been synthesized *in vitro*. The synthetic material (sodium salt) had no action at concentrations [M ?] of 10^{-7} or 10^{-8} on stem explants of *Parthenocissus tricuspidata* in culture, but from 10^{-6} up to and including 10^{-4} growth stimulation increased. The action resembled, but was weaker than, that of IAA, and the proliferated tissue was healthy and normal at 10^{-5} and 10^{-6}. Similar results were obtained with fragments of tubers of Jerusalem artichoke. With chicory root explants the 10^{-4} concentration was toxic, 10^{-5} slightly inhibitory, and the rest more or less inactive. In none of the experiments was there any indication of a root-inducing action of the 3-indoleglycolic salt.

1788. Sircar, S. M., and Kundu, M.
Growth regulating properties of the root extract of water hyacinth (*Eichhornia speciosa* Kunth.).
Physiol. Plant., 1960, **13**: 56-63, bibl. 12, illus.

An unidentified root extract from water hyacinth stimulated shoot growth of both monocotyledonous and dicotyledonous plants, but root growth was inhibited.—Univ. Calcutta.

1789. Carr, D. J.
Translocation between leaf and meristem in the flowering response of short-day plants.
Reprint from *Proc. 9th int. bot. Congr. 1959*, Vols. II, IIA, 1 p. abstr.

In short-day plants a labile substance is produced in the leaves during the dark period, which is translocated with the sugars to the shoot apical meristems where it is transformed into a stable flower hormone. Flower formation is initiated when a critical level of flower hormone is reached. Long days inhibit this process, probably as a result of the formation of gibberellin. The time required for flower production to be inhibited by long days depends on the number of long dark periods previously undergone and on the species of plant.

1790. Asen, S., Cathey, H. M., and Stuart, N. W.
Enhancement of gibberellin activity by hydrangenol isolated from leaves of *Hydrangea macrophylla*.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxxv.

Hydrangenol alone exhibited little growth regulating activity, but it enhanced the growth response induced by low concentrations of GA when applied to leaves of mutant dwarf peas, beans, chrysanthemums and hydrangeas.—U.S.D.A., Beltsville, Md.

Packing and storage.

(*See also* 2543, 2921, 2922.)

1791. Gaston, H. P., and Levin, J. H.
Equipment and layout for fruit packing houses.
Spec. Bull. Mich. agric. Exp. Stat. **417**, 1957, pp. 28, bibl. 7, illus. [received 1960].

1792. Organization for European Economic Co-operation.
Standardization of wooden packaging for fruit and vegetables.
Docum. 1960 Ser. EPA/OEEC **25**, 1960, pp. 200, illus., 12s. 6d.

Includes data on size and packing arrangements for apples and pears, lettuces, tomatoes and cauliflowers.

1793. Guillou, R.
Fruit cartons in bulge test.
Calif. Agric., 1960, **14**(11): 15.

Proneness to bulge is measured by means of a rubber bladder inflated within the carton.

1794. Truelsen, T. A.
Irradiation of fresh fruits and vegetables with pasteurizing doses.
Rep. Danish atom. Energy Comm., Risö **16**, 1960, pp. 73-5, bibl. 2.

Gamma-irradiation of strawberry fruits showed promise, and doses of 50 and 100 kilorad delayed fungus attack (at 7° C. storage) for 2 days. Storage life and fruit quality of Wellington black currants were not improved by irradiation. Fungus infection in raspberries was delayed by irradiation, but the fruit was bleached and fruit texture deteriorated rapidly. Irradiation reduced fungus attack in Morello cherries stored at 7° C., but fruit quality was spoiled. No effect on infection by storage rots was observed with plums. Cox's Orange and Ingrid Marie apples stored at 12° C. after irradiation developed no storage rots but fruit quality deteriorated. After irradiation cauliflower did not develop storage rots at 5° C., but at 15° C. there was no appreciable delay in fungus attack. Irradiation of tomatoes did not delay fungus attack, and after dosages with 250 and 500 kilorad fungal infection was worse than in the unirradiated controls; irradiated tomatoes softened more rapidly than unirradiated ones.

1795. Cornwell, P. B., and Bull, J. O.
Insect control by gamma-irradiation: an appraisal of the potentialities and problems involved.
J. Sci. Food Agric., 1960, **11**: 754-68, bibl. 23, illus.

Results of research and problems of application are examined in relation to the two potential methods of controlling insect pests by irradiation: indirect control by the release of sterilized adults and the direct treatment of infested products. Application of the first method is limited to very few species. Direct treatment could have wider application for the control of all species infesting stored products. It is concluded that among factors which may influence the success of radiation disinfestation, bulk handling and the incorporation of treatment into established handling procedures must receive primary consideration. [From authors' abstract.]—Wantage Radiat. Lab., Berks.

1796. Jones, A. H.
Fungicidal paints.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 10.

Incorporation of 0·5–1·0% di-phenyl mercury dodecenyl succinate in the paint effectively inhibited the development of bacteria and fungi on the walls of cold stores for 4 years. [For earlier work see *H.A.*, 30: 3221.]—Cent. exp. Fm, Ottawa.

Herbicides and weed control.

(*See also* 1775-1777, 1823, 1829, 3558.)

1797. Anon.
Technical information 1960. NIA 5996 an experimental herbicide.
***Idem.* Karsil an experimental herbicide.**
***Idem.* Solan an experimental herbicide.**
Tech. Inf. Sheet Niagara chem. Div., 1960, pp. 10, pp. 12 and pp. 9, respectively.

NIA (2,6-dichlorobenzonitrile) is active against weeds before they emerge and is best incorporated into the top 0·5–1·5-in. layer of soil. Karsil (N-(3,4-dichlorophenyl)-2-methylpentanamide) is primarily active on annual grasses up to 1·5 in. tall and annual broadleaved weeds up to 2 in. tall. Solan (N-(3-chloro-4-methylphenyl)-2-methylpentanamide) is most effective on both broadleaved and grassy weeds soon after emergence. Crops tolerant of each of the 3 compounds included vegetables, flowers and some fruits.—From *Weed Abstr.*, **9**, Nos. 1490, 1491 and 1492, respectively.

1798. Mühling, G. N., and others.
Cytological effects of herbicidal substituted phenols.
Weeds, N. York, 1960, **8**: 173-81, bibl. 20, illus.

When the meristematic region of young pea seedlings was treated with 9 substituted phenols all compounds were found to cause a reaction quantitatively and qualitatively similar to that of colchicine, and an ultimate inhibition of the onset of cell division. All compounds appeared to be potential polyploidizing agents, but only with 2,4,6-trichlorophenoxyacetic acid was a significant amount of polyploidy obtained.—Mich. St. Univ., East Lansing.—From *Weed Abstr.*, **9**, No. 1512.

1799. Sweetser, P. B., and Todd, C. W.
Factors affecting the monuron inhibition of oxygen liberation in photosynthesis.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): x.

Evidence is presented that the phytotoxicity of monuron to plants is not solely due to the depletion of the energy of nutrient supply, but also involves the accumulation of a phytotoxic compound originating as a result of a blockage on the oxygen-liberating pathway.—E. I. du Pont de Nemours and Co., Wilmington, Delaware.

1800. Jagendorf, A. T., and Margulies, M.
Inhibition of spinach chloroplast photosynthetic reactions by p-chlorophenyl-1,1-dimethylurea.
Arch. Biochem. Biophys., 1960, **90**: 184-95, bibl. 33.

Biochemical responses to the herbicide CMU.

1801. Ashton, F. M.
The effect of atrazine on the metabolism of C^{14} sucrose in excised bean leaves in the dark.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxviii.

The total activity and sucrose activity of red kidney bean leaves treated with 10 p.p.m. atrazine were less than in untreated leaves.—Univ. Calif., Davis.

1802. Levacher, P.
Analyse des anomalies produites par l'acide 2,4-dichlorophenoxyacétique sur le persil commun (*Petroselinum sativum* L.) en rapport avec l'ontogénie. **(An analysis of the deformities caused by 2,4-D in parsley in relation to ontogeny.)**
C.R. Acad. Sci. Paris, 1960, **250**(8): 1537-9, bibl. 1, illus.

The deformities, which are illustrated and described, were found to be correlated with the developmental stage of the tissue when treated.—Lab. Bot., Sorbonne, Paris.—*Weed Abstr.*, **9**, No. 1279.

1803. Crafts, A. S., and Yamaguchi, S.
Absorption of herbicides by roots.
Amer. J. Bot., 1960, **47**: 248-55, bibl. 38, illus.

Studies with 2,4-D and several other chemicals on 4 types of plant, including beans.

1804. Crafts, A. S.
Relative mobility and redistribution of labeled tracers in plants.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): iii-iv.

The distribution of a tracer of low or intermediate mobility, such as 2,4-D, may depend on the growth activity of the plant, whereas freely mobile compounds such as MH attain thorough distribution. With foliar application dalapon attains only a very low root concentration. Monuron, simazine and calcium enter roots and move freely in the transpiration stream but will not move appreciably from foliar application. From either root or leaf application 2,3,6-trichlorobenzoic acid was very mobile and accumulated in the young shoot tip of bean, causing severe distortion. [For earlier work see *H.A.*, 28: 2511f.]—Univ. Calif., Davis.

1805. Dybing, C. D., and Currier, H. B.
Foliar penetration by chemicals.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxx-xxxi.

Tests with aqueous solutions of herbicides and nutrients were carried out using fluorescent and radioactive tracers and a precipitation method. Stomatal penetration occurred rapidly when an efficient surfactant was used at the proper concentration. Surfactants varied in their ability to promote stomatal entry and the concentration necessary varied with the species. The open stomata of *Pyrus communis* were readily penetrated, whereas those of *Phaseolus vulgaris* required a relatively greater concentration of surfactant for entry. Stomatal penetration by surfactant-free solutions was not clearly demonstrated. Cuticular penetration occurred, but was relatively slow with most species tested; hairs, areas over veins and areas above anticlinal epidermal cell walls were the preferred sites of entry.—Univ. Calif., Davis.

1806. Renauld, D.
Le désherbage chimique de la vigne, des asperges et des pépinières par les dérivés de l'urée (monuron, diuron, néburon). (**Chemical weed control in vine and asparagus crops and in nurseries with the urea derivatives monuron, diuron and neburon.**)
Fruits et Prim., 1960, **30**: 159-60.

In France diuron is used in vineyards and for seedling and young asparagus, monuron for asparagus beds in production, and neburon for woody-plant nurseries and strawberries. Dalapon is complementary to the urea derivatives and destroys *Agropyron repens* and annual grasses.

1807. Anon.
Weed control in horticultural crops.
From abstr. in *Proc. Mtg Weed Soc. Amer.*, *1960*, pp. 10-16.

The 13 reports received deal with weed control in strawberries, several vegetables, bulbs and in orange seedlings in the greenhouse.—See *Weed Abstr.*, **9**, No. 1405.

1808. Anon.
The control of aquatic and marginal weeds.
From abstr. in *Proc. Mtg Weed Soc. Amer.*, *1960*, pp. 62-8.
Aquatic and ditch bank weeds.
Res. Progr. Rep. west. Weed Control Conf., *1960*, pp. 55-68.

Methods of controlling water weeds are summarized from 11 and 12 reports respectively.—See *Weed Abstr.*, **9**, Nos. 1433 and 1434.

1809. Lhoste, J.
La destruction de la végétation aquatique ou semi-aquatique envahissant les cours d'eau. (**The destruction of aquatic and semi-aquatic weeds invading waterways.**)
[*Publ.*] *Off. Rech. sci. tech. Outre-Mer*, [undated], pp. 42, bibl. 20.

Mechanical and chemical control measures are described in detail for different weed types and for various individual species, and the effects of treatments on the natural fauna and flora are summarized, including data on the comparative toxicity of 16 herbicides to fish.

Plant protection.

(*See also* 1705, 1860, 2604, 2609, 2802, 2887, 3029, 3226, 3335, 3548, 3554, 3556.)

1810. American Phytopathological Society, Committee on Phytopathological Reviews.
Bibliography of reviews 1949-1959.
Phytopathology, 1960, Vol. **50**, No. 8 (part 2, special number), pp. 116.

An annotated bibliography of reviews and of articles containing reviews on plant pathology, listed under the headings of: general considerations, causal factors, host plants, host-pathogen interaction, disease in populations, disease categories, disease control, instrumentation.

1811. Moreau, C.
La vocation phytopathologique du laboratoire de cryptogamie du Muséum National d'Histoire Naturelle. (**The work of the mycological laboratory of the National Museum of Natural History (Paris) in plant pathology.**)
Reprint from *Rev. Mycol.*, 1960, **25**: 83-134, bibls, illus.

A review of more than 50 years' work.

1812. Justesen, S. H., and Tammes, P. M. L.
Studies of yield losses. I. The self-limiting effect of injurious or competitive organisms on crop-yield. [Dutch summary 6 lines.]
Tijdschr. PlZiekt., 1960, **66**: 281-7, bibl. 13, illus.

Four hypothetical models illustrate how competition between pathogens diminishes the effect of individuals as numbers increase. As a result the relation between crop yield or growth and the initial population level is not linear. The effect on yield falls off as the initial population increases; when graphed, the yield curve tends to become horizontal. [Authors' summary.]—PlZiektDienst and Centr. LandbWisk., Wageningen.

1813. JACKS, H.
Aerial spraying with therapeutants and fertilizers.
Fruit and Prod., July 1960, pp. 15-18.

The methods of application, the distribution and deposit of therapeutants and fertilizers in the form of dusts, solutions, emulsions and suspensions are discussed, together with rates of application and the effects of a number of therapeutants in current use.

1814. DE LA TORRE R., G.
La acción dañina de los pesticidas sobre las abejas. Recientes investigaciones en los Estados Unidos de Norteamérica. (**The injurious effects of pesticides on bees. Recent investigations in the U.S.A.**)
Agronomía, Lima, 1959, **26**: 114-17, bibl. 1.

Numerous fungicides, insecticides and acaricides are listed in 4 groups according to their degree of toxicity to bees. Similarities between the problems of bee protection in the U.S.A. and in Peru are discussed.

1815. YARWOOD, C. E.
Topical susceptibility of plants to viruses.
Virology, 1960, **12**: 245-57, bibl. 23, illus.

The reaction of plants to virus infection varied with the site of inoculation. Beans were more susceptible to each of 3 viruses when inoculated on the upper surfaces of their true primary leaves than when inoculated on their lower leaf surfaces. Inoculation of bean stems caused systemic symptoms of greater severity, of more rapid appearance, and in a greater proportion of cases than inoculation of leaves, hypocotyls or roots. Inoculation of bean hypocotyls with peach yellow bud mosaic virus generally resulted in root invasion, but with no symptoms in the roots or tops, and no apparent reduction in plant growth until long after inoculation on the stems had caused death of the growing point. When tobacco roots were inoculated with TMV, no apparent growth reduction of the tops was found, and the virus reached a lower concentration in the roots than when plants were inoculated via the leaves. In beans infected with tobacco necrosis virus via the leaves the reduction in growth was greater than when infected via the petioles, stems, hypocotyls or roots. Differences in topical susceptibility were also demonstrated in cucumber and other plants. [From author's summary.]—Univ. Calif., Berkeley.

1816. GOTTLIEB, D.
Better pest control with antibiotics?
Ill. St. Flor. Ass. Bull., 1960, No. 207, pp. 7-8.

Notes on the systemic bactericide Vancomycin.

1817. GUNDERSEN, K., AND NIELSEN, F. H.
Actidion—et antibiotikum i plantesygdomsbekaempelsen. (**Actidione—an antibiotic for plant disease control.**) [English summary 12 lines.]
Horticultura, 1960, **14**: 171-6, bibl. 21.

Work on the composition and behaviour of Actidione is reviewed. Some Danish experiments have confirmed that this antibiotic is promising for control of powdery mildew on several ornamentals, including roses and begonias.

1818. BLUMER, S., AND KUNDERT, J.
Über den Einfluss der Temperatur auf die Wirkung von Fungiziden. (**The effect of temperature on the action of fungicides.**) [French and English summaries ½ p. each.]
Landw. Jb. Schweiz, 1960, **74**: 465-95, bibl. 13.

Dealing with the action of copper sulphate, hydroxyquinoline and glyodin on *Alternaria tenuis*, *Clasterosporium carpophilum*, *Botrytis cinerea* and *Monilia fructigena* at different temperatures.

1819. GUILLEMAT, J., AND LAMBERT, J.
I. Étude du pouvoir fongicide du carbatène. II. Étude des mélanges carbatène et sels cupriques. (**I. A study of the fungicidal activity of carbathene. II. A study of mixtures of carbathene and copper salts.**)
Phytiat.-Phytopharm., Paris, 1960, **9**: 7-21, bibl. 5.

Carbathene was equal or slightly inferior to copper oxychloride and copper sulphate and 3–11 times more effective than zineb in inhibiting the germination of spores of *Alternaria citri*, *Fusarium coeruleum*, *F. roseum* and *Botrytis allii* and of the conidia of *Plasmopara viticola*. Carbathene-copper mixtures exhibited a distinct synergistic effect. In a field trial a mixture containing 12% carbathene and 63·2% tetracupric oxychloride was at least as effective as 2% bordeaux mixture against *Plasmopara viticola*.—Lab. Path. veg., E.N.A., Grignon.

1820. ROSSI, G., AND CORRADINI, V.
New series of organic compounds having polyvalent fungicidal activity.
Chim. Indust., Milan, 1960, **42**: 237-42, bibl. 10, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-155.

Acetates and benzoates of various dialkyldithiocarbamoyl- and alkylxanthyl-carbinols; of these dimethyldithiocarbamoylcarbinol benzoate was particularly effective against *Oidium*, mildew and rust.

1821. Edgington, L. V., and Dimond, A. E.
Controlling translocation of quaternary ammonium chemotherapeutants with cations and solvents.
From abstr. in *Phytopathology*, 1960, **50**: 634.

Fungitoxic quaternary ammonium compounds in water are relatively immobile in plants because the positively charged ion is adsorbed to negatively charged plant tissue. This adsorption can be counteracted by thorium or calcium ions, but thorium is phytotoxic. However, 10^{-2} M $CaCl_2$ enhances the translocation of the quaternary ammonium ion in tomato cuttings. The adsorption of the quaternary ammonium compounds can also be prevented by organic solvents such as ethanol, isopropanol, acetone, tetrachloroethane and nitrobenzene.

1822. Rayner, R. W.
Separate determination of copper fungicide dosage on the upper and lower surfaces of leaves.
J. agric. Engng Res., 1960, 5: 441-2, bibl. 5, illus.

Flat leaf discs were floated on sulphuric acid to remove the copper from one surface only. The method was developed for evaluating spraying techniques against coffee rust.—Commonw. mycol. Inst., Kew.

1823. Morgan, O. D.
Chemical control of algae and other nuisance growths on greenhouse benches, pots, and potting soil.
Plant Dis. Reptr, 1959, **43**: 660-3, bibl. 8, illus.

Chemical 5400 (alpha, alpha-trithiobis (N-dimethylthioformamide)) gave almost complete control of fungi, algae and moss growths on sand in glasshouse benches for 2½ to 3 months. Control with dichlone lasted for about 2 months. Chemical 5400 at 800 and 1,200 p.p.m. controlled algae in pots for 18 weeks, while dichlone gave partial control during the same period. Both materials were less satisfactory for moss control, although Chemical 5400 (at 2lb./100 gal.) showed 86% control after 6 weeks.—Univ. Md agric. Exp. Stat., College Park.

1824. Good, J. M., and Steele, A. E.
Evaluation of application methods for applying 1,2-dibromo-3-chloropropane for control of root knot.
Plant Dis. Reptr, 1959, **43**: 1099-1102, bibl. 13, illus.

A comparison of several methods of applying 1,2-dibromo-3-chloropropane for control of root-knot nematodes (*Meloidogyne incognita incognita*) indicated that both liquid and granular formulations gave adequate control if the chemical was placed 6 in. or more under the soil surface, regardless of formulation or method of application. A granular formulation applied to the soil surface and disked in was not as effective as other methods of application.—U.S.D.A., Tifton, Ga.

1825. Kriegler, P. J.
Tedion, a new miticide for red spider.
Dec. Fruit Gr, 1960, **10**: 224-5, illus.

Tedion 20% w.p. at 1 lb./100 gal., or e.c. 8·6% at 1½ pt./100 gal., gives poor control of adult mites but has a very long residual action against the young developing stages.

1826. Hall, C. V.
Effects of miticides on populations of two-spotted spider mites *Tetranychus telarius* (L.).
Diss. Abstr., 1960, **21**: 706, being *L.C. Card No. Mic.* 60-2658 of 66 pp.

Chlorothion, Dibrom 8, Dimethoate, Kelthane W.P., Niagara 908 and 1137, Orthomite, Phosphamidon, schradan, Trithion, American Cyanamid 12008 and 12009 all gave highly effective control of the mite after one day. At 10–14 days after treatment only Dimethoate, Niagara 908, schradan, Thimet E.C., 12008 and 12009 remained highly effective. Kelthane and schradan were the only commercially available acaricides which were highly effective in initial kill as well as for residual control. The most effective ovicides were Dimethoate, Ethion and Kelthane. Chlorothion appeared to stimulate hatching. After lindane treatment populations were initially slightly reduced, but at the end of the sampling period mite feeding symptoms were more severe than on control plants. Malathion showed a similar trend, but population increases were less severe. Thimet was toxic in all formulations except the E.C. spray. Synergism was observed when piperonyl butoxide was combined with malathion, but it was antagonistic to the action of Kelthane.—Kans. St. Univ.

1827. Wallace, C. R.
Report on an investigation of agricultural pests in St. Helena, 1957-1959.
[*Publ.*] *Colon. Office, Lond.*, 1960, pp. 54, bibl. 37.

Including pests of vegetables, fruits and ornamentals. Control measures are discussed at length.

1828. Winfield, J. B.
A consumer-safe insecticide.
World Crops, 1960, **12**: 335-8, bibl. 2, illus.

Phosdrin, effective against aphids, mites and caterpillars on vegetable, fruit and plantation crops.

1829. Shaw, W. M., and Robinson, B.
Pesticide effects in soils on nitrification and plant growth.
Soil Sci., 1960, **90**: 320-3, bibl. 7.

When aldrin, heptachlor and 2,4-D at 10 to 100 lb. and chlordane at 30 to 300 lb. per acre were applied to a Cumberland silt loam no inhibition of nitrification resulted. Subsequent growth of tomato on this soil was unaffected by aldrin and heptachlor, but chlordane reduced growth slightly at the 120 and 180 lb. rates and severely at the 300 lb. rate. On the soil which had received 2,4-D all the plants died. Similarly, treatment of Hartsells sandy loam with 20 to 200 lb. aldrin, dieldrin, heptachlor and DDT, 30 to 300 lb. chlordane and 10 to 100 lb. simazine per acre did not affect soil nitrification. Tomato growth was depressed slightly by the 150 and 200 lb. aldrin, dieldrin and DDT treatments and markedly by the 120 lb. chlordane and 200 lb. heptachlor treatments. Practically no tomato growth followed simazine treatment.—Univ. Tenn. agric. Exp. Stat.

1830. Beye, F.
Die Wirkungen von Insektiziden in unterschiedlicher Formulierung (Spritzpulver und Emulsion) auf das Wachstum der Kressewurzel. **(The effects of insecticides applied in different formulations (wettable powders and emulsions) on the growth of cress roots.)**
Naturwissenschaften, 1960, **47**: 500-1, bibl. 4. bibl. 4.
Wirkungen von Insektizidemulsionen auf das Wachstum von Kressewurzeln (*Lepidium sativum* L.). **(The effects of insecticide emulsions on the growth of cress roots.)**
Ibid., 1960, **47**: 501-2, bibl. 3.

I. Emulsions of DDT and phencapton inhibited the growth of cress roots more severely than did wettable powders. II. The action of the following insecticide emulsions on the growth of cress roots is reported: malathion, Dipterex, lindane and thiodan.

1831. Lichtenstein, E. P., and Schulz, K. R.
Translocation of some chlorinated hydrocarbon insecticides into the aerial parts of pea plants.
J. agric. Food Chem., 1960, **8**: 452-6, bibl. 18, illus.

Lindane absorbed by the roots was translocated to the aerial parts of the plant. No evidence was obtained of absorption of lindane vapours from the soil through the leaf cuticle. Leaves and stems of plants growing in sand treated with (1) aldrin or heptachlor and (2) dieldrin or heptachlor epoxide all contained dieldrin and heptachlor epoxide, indicating that epoxidation took place within the plant tissue. No evidence of DDT translocation was obtained. Seeds from plants grown in a soil treated with 5 and 25 lb. aldrin or heptachlor per acre contained no measurable insecticidal residues. —Univ. Wis., Madison.

1832. Moens, R.
Progrès accomplis dans la lutte contre les limaces. **(Progress in slug control.)**
Rev. Agric., Brux., 1960, **13**: 3-11, bibl. 21.

After a brief review of injuries caused by various species of slug to field, market-garden, ornamental and fruit crops, mushrooms and aquatics, an account is given of trials of various materials, including quicklime, sylvinite, sylvinite plus copper sulphate, metaldehyde, calcium cyanamide, DNOC and some insecticides. Of 3 metaldehyde preparations granulated bait was the best. It remained effective for up to 2 weeks and, like 4% bran, was effective for the protection of young crops in summer against *Arion rufus*, *A. hortensis* and *A. subfuscus*. Non-oily calcium cyanamide was effective against all surface species when applied at 300–500 kg. dust per ha. Spraying a suspension of 30 g. dust in 2 l. water per sq. m. gave complete control of all species on the surface and partial control of those in the upper layers of the soil. For example, spraying against *A. hortensis* at the end of November gave 100% control on the surface, 80–90% at a depth of 0–2 cm., 60–80% at 2–5 cm. and 20–40% at 5–10 cm. The ammonium salt of DNOC gave control of certain species, e.g. *A. hortensis* and *Milax gracilis*, and remained effective for 1–2 weeks. Parachloronitrobenzene has an immediate action but no residual effect. Chlorthion, Isochlorthion and Gusathion sprays controlled *Limnaea peregra* in water-cress beds [see also *H.A.*, 29: 1510 and 1511].—Stat. Ent. État, Gembloux.

1833. Thearle, R. J. P.
The use of narcotics in catching harmful birds.
Ann. appl. Biol., 1960, **48**: 414-15.

Baits containing α-chloralose successfully controlled grain-eating species.

1834. Wright, E. N., and Summers, D. D. B.
The biology and economic importance of the bullfinch.
Ann. appl. Biol., 1960, **48**: 415-18, bibl. 8.

Feeding habits on fruit trees; control is best effected by trapping.

Chemical residues and their analysis.

(*See also* 2311, 2312, 3173, 3183, 3528, 3535.)

1835. Needham, P. H.
An investigation into the use of bioassay for pesticide residues in foodstuffs.
Analyst, 1960, **85**: 792-809, bibl. 98.

A survey of methods in use or being developed at major research stations in Britain, Holland and Germany.

1836. HEINISCH, E.
Chemische Methoden zum Nachweis oder zur Bestimmung von Pflanzenschutzmittelrückständen auf oder in pflanzlichem Erntegut. III. Hexachlorcyclohexan. **(Chemical methods for the determination and estimation of residues of plant protective substances on or in the crop. III. Benzene hexachloride.)** [Russian and English summaries 19 lines each.]
NachrBl. dtsch. PflSchDienst, Berlin, 1960, **14**: 86-98, bibl. 106.
For parts I and II see *H.A.*, 30: 1571 and 4768.

1837. EGAN, H., AND EVANS, W. H.
Application of the total organic chlorine method to the determination of endrin and thiodan residues in blackcurrants.
Analyst, 1960, **85**: 842-3, bibl. 6.

1838. EGAN, H., AND WOOD, R.
Determination of organic fluorine residues in blackcurrants.
J. Sci. Food Agric., 1960, **11**: 582-4, bibl. 7.
A description of a method suitable for insecticide residues in the fruit.

1839. CHILWELL, E. D., AND BEECHAM, P. T.
Residues of *OO*-dimethyl *S*-(*N*-methylcarbamoylmethyl) phosphorothiolothionate (Dimethoate) in sprayed crops.
J. Sci. Food Agric., 1960, **11**: 400-7, bibl. 12.
A description of a method which is suitable for the detection of Dimethoate (Rogor) residues in fresh fruit and vegetables and dried hops, tobacco and tea.

1840. CHANCOGNE, M., AND NAKAMURA, H.
Méthode biologique de dosage des résidus de captane. **(Biological method of determining captan residues.)**
Phytiat.-Phytopharm., Paris, 1960, **9**: 3-6, bibl. 5.
By inhibition of the growth of *Glomerella cingulata.*

1841. MELTZER, H.
Zur qualitativen und quantitativen colorimetrischen Bestimmung von Captan. **(Qualitative and quantitative colorimetric determination of captan.)** [English and Russian summaries 18 lines each.]
NachrBl. dtsch. PflSchDienst, Berlin, 1960, **14**: 193-5, bibl. 2.

1842. FISCHER, W., AND UHLICH, U.
Infrarotspektrographische Bestimmung von Captanrückständen auf Erdbeeren. **(Infra-red spectrographic determination of captan residues on strawberries.)**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1960, **12**: 187-8, bibl. 2.
The spectrum between 12 and 13μ of the unpurified residues in benzene solution was determined. A calibration curve for pure captan solutions was employed. This method can be used to estimate captan residues in the range 40–145 p.p.m.—Inst. PflSchMittelforsch., Berlin-Dahlem.

1843. STELLER, W. A., AND OTHERS.
Colorimetric estimation of dodecylguanidine acetate residues.
J. agric. Food Chem., 1960, **8**: 460-4, bibl. 13.
A description of a method which has been used to measure residues in apples, pears, sour cherries and apple leaves.

1844. PICKARD, J. A., AND MARTIN, J. T.
Determination of mercury in plant material.
J. Sci. Food Agric., 1960, **11**: 374-7, bibl. 10.
A description of an analytical procedure which has given high recoveries of Hg from apple, tomato and ground coffee.

1845. MUZIK, T. J., AND WHITWORTH, J. W.
A biological method for determining persistence of chemicals in plant tissues.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxvi.
The method involves the introduction of meristems from untreated plants into treated plants by grafting. Work with tomato showed that 2,4-D persisted for at least 90 days.—Wash. St. Univ., Pullman.

1846. AGRICULTURAL RESEARCH COUNCIL RADIOBIOLOGICAL LABORATORY.
Strontium 90 in human diet in the United Kingdom 1959.
Rep. A.R.C. radiobiol. Lab. **3**, H.M.S.O., London, 1960, pp. 58, bibl. 21, 3s. 6d.
Including data on leafy brassicas and tea. [For 1958 report see *H.A.*, 30: 622.]

Experimental and statistical techniques.

(*See also* 2699, 2710-2713, 2721, 2803, 2848, 2914, 3511.)

1847. VAN DEN HENDE, A., AND COTTENIE, A. H.
L'estimation de la fertilité du sol par les méthodes chimiques nouvelles. **(The estimation of soil fertility by new chemical methods.)** [English and Dutch summaries, 1 p. each.]
C. R. Rech. I.R.S.I.A., 1960, No. 25, pp. 236, bibls, illus., 270 fr.
An account of work at the Agricultural Centre for Physical Chemistry, Ghent, on chemical analysis of soils and plants, spectrographic analysis of plants, and radioactive isotopes in plant nutrition studies.

1848. Cottenie, A.
L'emploi des radio-isotopes dans l'étude de la nutrition des plantes. **(The use of radioactive isotopes in the study of plant nutrition.)**
Rev. Agric., Brux., 1960, **13**: 13-27, bibl. 26.

A review of methods in present use.

1849. Vose, P. B.
X-ray spectrography of plant material.
Lab. Pract., 1961, **10**: 30-1, 36, bibl. 9.

A review of recent techniques.

1850. Ward, G. M., and Johnston, F. B.
Chemical methods of plant analysis.
Publ. Canada Dep. Agric. **1064**, 1960, pp. 59, bibls.

Techniques for preparing samples, obtaining extracts and determining moisture, ash, mineral elements, sugars and starch.

1851. Mitchell, R. L.
Contamination problems in soil and plant analysis.
J. Sci. Food Agric., 1960, **11**: 553-60, bibl. 14.

1852. McCready, R. M., and Gee, M.
Determination of pectic substances by paper chromatography.
J. agric. Food Chem., 1960, **8**: 510-13, bibl. 24, illus.

In fruits and vegetables.

1853. Martin, J. T.
Determination of the components of plant cuticles.
J. Sci. Food Agric., 1960, **11**: 635-40, bibl. 20.

Methods employed for leaves and fruits. [For the results obtained, see *H.A.*, 30:1700.]

1854. Emmert, F. H.
Estimation of stem xylem volume using radioisotopes.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): iv-v.

In bean stems using P^{32} solution.

1855. Challen, S. B.
Contribution of surface characters to wettability of leaves.
J. Pharm., Lond., 1960, **12**: 307-11, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-156.

A technique based on the preparation of carnauba wax replicas of leaf surfaces is described.

1856. Linford, M. B., and Rhoades, H. L.
Centrifugation of roots before determining moist weight.
Plant Dis. Reptr, 1959, **43**: 987-8, bibl. 1.

The spinning tub of a domestic automatic washing machine is an effective low-speed centrifuge for removal of surface water from washed root systems before determining moist weight. [From authors' abstract.]—Univ. Ill., Urbana.

1857. Tamaoki, T., Hildebrandt, A. C., and Riker, A. J.
Use of pectinase in preparation of mitochondria from tobacco-tissue cultures.
Science, 1960, **132**: 1766-7, bibl. 6.

A method is described which reduces the dry weight of the particulate preparation and eliminates glutinous material but causes little change in oxidative and phosphorylative activities.—Univ. Wis., Madison.

1858. Pratt, H. K., and others.
Simple method for continuous treatment of plant material with metered traces of ethylene or other gases.
Plant Physiol., 1960, **35**: 609-11, bibl. 12, illus.

For investigating the effects of ethylene on fruit ripening, etc., traces of the gas can be metered accurately into larger air streams by the use of a Mariotte bottle and simple combinations of flowmeters. Special applications are described.

1859. Monk, R. W., and Wiebe, H. H.
Growth and survival of some ornamental plants on salinized soils and substrates and the resistance of their protoplasm as related to salt tolerance.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxiv.

A comparison was made of 2 methods of testing the resistance of plant tissues to salt. These were the plasmolytic method and a new 2,3,5-triphenyl tetrazolium chloride method. Both were equally reliable but the TTC method was easier to apply and to interpret. A relationship was found between the tissue resistance to salt and the salt tolerance of the plants.—Utah St. Univ., Logan.

1860. Klotz, L. J., DeWolfe, T. A., and Baines, R. C.
Laboratory method for testing effectiveness of soil disinfestants.
Plant Dis. Reptr, 1959, **43**: 1174-5, bibl. 1, illus.

A laboratory method is described by which a rapid determination may be made of the fungicidal value of liquids and water-soluble chemicals at various soil depths. Citrus seedlings inoculated with *Phytopththora parasitica* have been used as test plants.—Univ. Calif. Citrus Exp. Stat., Riverside.

1861. Anon.
La méthode des variantes systématiques. **(The method of systematic variants.)**
Fruits d'Outre Mer, 1960, **15**: 371-4, bibl. 8.

A discussion and explanation of the method invented by M. V. Homès [see *H.A.*, 30: 2932 and earlier] for conducting fertilizer trials, based on determining optimum anion/cation relationships.

1862. PEARCE, S. C., AND HOLLAND, D. A.
Some applications of multivariate methods in botany.
Reprint from *Appl. Statist.*, 1960, **9**, pp. 7, bibl. 8.

The techniques of component analysis and factor analysis are here reviewed in relation to biological problems, and their utility in this context is studied by considering their application to some of the problems of fruit tree growth and cropping. [Authors' abstract.—See also *H.A.*, 29: 2069.]—E. Malling Res. Stat., Kent.

Practical and research equipment.

(*See also* 1725, 1856, 1954, 1960, 1992, 2030, 2040-2042, 2044, 2045, 2097, 2106, 2281, 2313, 2364, 2392, 2436, 2640, 2641, 2680, 2748, 2826-2839, 2865, 2962, 3137, 3175-3177, 3188, 3208, 3209, 3297, 3383, 3416, 3489, 3494, 3557, 3572, 3576, 3580.)

1863. ELECTRICAL DEVELOPMENT ASSOCIATION.
Electricity in your garden.
[*Publ.*] *Elect. Dev. Ass.*, London, revised 1960, pp. 48, illus.

The booklet covers the use of electricity in the frame and glasshouse for soil warming, space heating, propagation (including mist), ventilation, automatic watering and plant hygiene. Also dealt with is the use of electric light in plant culture, and the use of electric power for lawn mowers, hedge trimmers, chain saws and pumps.

1864. ANON.
Heat treatment machine does work of ten men.
Comm. Gr, 1961, No. 3394, p. 123, illus.
Continuous flow speeds up warm water treatment.
Grower, 1961, **55**: 380, illus.

A machine for the hot-water treatment of planting stock has been developed, and was tested commercially with chrysanthemum stools. The plants travel in wire-mesh baskets through the hot-water bath at a speed which can be varied according to requirements.

1865. ANON.
Sondernummer: Maschinen für den Gartengestalter. (**Special number: machines for the garden designer.**)
Schweiz. Gärtnerztg, 1960, **63**: 273-82, illus.

Brief notes are given on machines and implements used in landscape gardening and sports ground establishment and maintenance, including a small soil excavator, levelling instruments, rototillers, motorized rollers, mowers, fertilizer distributors and sprayers.

1866. ANON.
La meccanizzazione migliora i rendimenti dei vivai, dei frutteti e degli orti. (**Mechanization increases yields in nurseries, orchards and market gardens.**)
Inf. Ortofruttic., 1960, **1**: 37-8, illus.

The body of the "Trampolo" tractor described can be raised, by hydraulic power, high above the wheels, for work with irrigating and spraying machines, cultivators, seed drills, fertilizer distributors and other attachments in high or moderately high crops.

1867. WOLFE, J. S., AND BULL, D. A.
Tractor steering in rowcrop cultivations. III. Influence of steering gear ratio on steering performance. [French and German summaries ¼ p. each.]
J. agric. Engng Res., 1960, **5**: 406-17, bibl. 5, illus.

In hoeing experiments with an experimental tractor on rows of lettuce the optimum performance occurred with a steering gear ratio in the range giving 0·80 to 1·42 inches hand movement per degree turn of the steered wheels. Three drivers reacted similarly to the different steering gear ratios, but each preferred a different travel speed. Travel speed, however, had only a very slight effect on performance.

1868. (MOE, C. M.)
Rotary harrow speeds cultivation.
West. Fruit Gr, 1960, **14**(7): 30, illus.

A powered rotary cultivator is described which is 10 times as fast as hand-hoeing. It is the only implement of this type which can cultivate under and around the trunks of grape vines and young trees without damaging them.

1869. SKIRKIN, G. G.
Development and orchard trials of a fertilizer and green manure seed distributor. [Russian.]
Bjull. nauč.-tehn. Inf., Mičurinsk, 1959, No. 8, pp. 12-17, illus.

A tractor-mounted rotating-disk type of distributor is described which spreads fertilizers and sows seeds in a broad strip or under low hanging branches of orchard trees.

1870. COOPER, D. J., AND HEENEY, H. B.
Note on a precision plot irrigator for use in irrigation studies.
Canad. J. Plant Sci., 1960, **40**: 745-9, bibl. 5, illus.

A description is given of a self-contained irrigator suitable for research plots and capable of movement and operation by one person. The irrigator consists essentially of a self-powered rotating boom supported on a tripod frame. Spray nozzles attached to the boom also supply power for rotation.—Canada Dep. Agric., Ottawa.

1871. LOWNSBERY, B. F., MITCHELL, J. T., AND HEAD, E. E.
An electric auger for nematological soil sampling in orchards.
Plant Dis. Reptr, 1959, **43**: 918-19, bibl. 2, illus.

The implement described allows 2 men to take soil borings to a depth of 3 ft. at the rate of one boring per minute.

1872. YATES, W. E.
Minimizing spray drift hazards.
Down to Earth, 1960, **16**(2): 15-19, bibl. 6, illus.

A spray rig designed to give good coverage at very low pressures is described. It gave a satisfactory performance in the application of 2,4-D herbicide in vineyards.—Univ. Calif., Davis.

1873. JOHNSTONE, D. R.
Performance of the modified S.A.6. boom and nozzle crop spraying installation fitted to a Dragon-fly helicopter.
Rep. colon. Pestic. Res. Unit, Porton Down **175**, [1960], pp. 13 + xx, bibl. 14, illus.

1874. ANON.
Machine speeds rope tying.
West. Fruit Gr, 1960, **14**(6): 44, illus.

A device enabling 1 man on the ground to reach high into a fruit tree and tie a rope to a limb needing support.

1875. TOENJES, W.
A rapid method of obtaining tree weight data on orchard trees.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 80-3, illus.

A team of 5 men could saw off and weigh a 14-year-old tree in 5–10 min. equipped with a sawhorse, a lifting pole fitted with a clevis and heavy ice tongs, 3 bracing poles with locking hooks, a cross-cut saw and platform scales on runners.

1876. PFLUG, I. J., JOFFE, F. M., AND NICHOLAS, R. C.
A mechanical recording pressure tester.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 117-21, bibl. 2, illus.

The construction and operation of a fruit and vegetable pressure tester having a mechanically driven plunger and force *vs.* displacement recording system is described. Examples of the application of this apparatus are presented. [Authors' summary.]

1877. YOERGER, R. R.
Development of a small crate dumping mechanism.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 89-91.

A small machine, requiring 50 lb. foot pressure, to lift crates and empty the fruit on to the grader conveyor belt.

1878. ROSENBERG, N. J.
A vibro-compaction method for greenhouse soil-structure studies.
Soil Sci., 1960, **90**: 365-8, bibl. 4, illus.

A description of the technique; the apparatus is a modified concrete vibrator. Applications of the method to flower-pot soil include studies of seedling emergence through soil crusts and of the growth of seedlings and plants as their roots pass from loose into compacted soil.—Rutgers Univ., N.J.

1879. (ROBERTSON, G. W., AND HOLMES, R. M.)
Light meter will give new impetus to plant research.
Comm. Gr, 1960, No. 3387, p. 1193, illus.

A spectral light meter, which measures light energy in 5 colour bands, is being used at the Central Experimental Farm, Ottawa, and will provide data on the growth-energy relationships in plants. It is claimed to be portable, economical and easy to operate.

1880. ZALIK, S., AND MILLER, R. A.
Construction of large low cost filters for plant growth studies.
Plant Physiol., 1960, **35**: 696-9, bibl. 6, illus.

The light filters described were designed for isolating narrow spectral regions. They consist of a series of tanks made of coloured plastic and containing various concentrations of copper sulphate solution.—Univ. Alb., Edmonton.

1881. BEHRENS, R., AND MORTON, H. L.
An environment system for plant studies with controlled temperature, humidity and light.
Weeds, N. York, 1960, **8**: 182-6, illus.

The system described, which cost $2,200 exclusive of labour, consists of 4 growth chambers 2·5 × 1 × 7 ft., in each of which the environmental conditions may be varied independently.—Univ. Minn., St. Paul.—*Weed Abstr.*, **9**, No. 1541.

1882. HIESEY, W. M., AND MILNER, H. W.
A cabinet for studying plants under controlled conditions.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): viii.

A self-contained movable growth chamber, 30 × 30 × 30 in., with air conditioning machinery and artificial lighting; 2 or more such units can be used to study clones of diverse climatic races.—Carnegie Instn Wash., Stanford, Calif.

1883. Watkins, P. W., and others.
A portable tape recorder for taking field notes.
Agron. J., 1960, **52**: 667-8.

At the University of Illinois the "Dictet" machine has proved satisfactory. Observations are transcribed and punched directly onto IBM cards.

Greenhouses and frames.

(*See also* 1863, 2485, 2579, 3580, 3606.)

1884. Anon.
"Bubble" house erected by Pennsylvania grower.
Flor. Exch., 1960, **135**(3): 8, illus.

This inflated, plastic glasshouse is supported by hot air and has a diameter of 20 ft. It costs less than $50 to construct.

1885. Renard, W., and Stein, J.
Der Einfluss des Windes auf die Gewächshauslüftung. (**The effect of wind on glasshouse ventilation.**) [English and French summaries ⅓ p. each.]
Gartenbauwiss., 1960, **25**: 134-50, bibl. 4, illus.

A study of glasshouse models in a wind tunnel.

1886. Whittle, R. M., and Lawrence, W. J. C.
The climatology of glasshouses. V. The heat consumption of glasshouses. [French and German summaries 8 lines each.]
J. agric. Engng Res., 1960, **5**: 399-405, bibl. 5.

In investigations on the effect of wind velocity on heat consumption in glasshouses, the overall heat transfer coefficient was found to be approximately 1 B.t.u. ft.$^{-2}$ hr.$^{-1}$ °F.$^{-1}$ at zero wind; a wind velocity of 15 m.p.h. doubled heat consumption. No economy was achieved by forced draught on to the heat source or by the use of reflectors over the heating pipes. Double glazing reduced heat consumption to about 60% of that of single glazing, but required a stronger glasshouse framework and more ventilators and it reduced light intensity. External cotton blinds were not a satisfactory means of reducing heat loss at night. [For part IV, see *H.A.*, 31: 187.]—John Innes hort. Instn, Bayfordbury, Herts.

1887. Morris, L. G.
Thermal insulation of glasshouses.
Comm. Gr, 1960, No. 3384, pp. 1037-9, illus.

The author discusses methods of reducing the heat loss from glasshouses, favouring polythene lining. —N.I.A.E., Wrest Park, Silsoe.

1888. Bierhuizen, J. F.
De relatie tussen temperatuur en licht, en de opbrengst van tuinbouwgewassen in kassen. (**The relationship between temperature and light and yields of horticultural crops in glasshouses.**) (English summary ⅓ p.]
Meded. Dir. Tuinb., 1960, **23**: 822-31, bibl. 12.

The author reviews the effects of light and temperature on crop development. In cold glasshouses during spring and autumn the temperature is in general higher and the light intensity is lower than in the field, so that there is a closer correlation between light intensity and yield. Yields of certain vegetables in pot experiments were studied in relation to the total radiation and temperature sums during spring and autumn. Dry weight yields during both seasons showed the same relationship to radiation sums; their relationships to temperature sums, however, were different in the spring and in the autumn, a higher temperature sum being required in the autumn than in the spring to produce the same yield.—Inst. CultTech. Waterhuish., Wageningen.

1889. Anon.
Orchidist goes automatic.
Flor. Exch., 1960, **135**(10): 8, illus.

Equipment to regulate the amount of radiant heat and sunlight entering a glasshouse has been developed for an orchid grower in Florida. Aluminium louvers are mounted above the glasshouse roof, and are electrically operated in response to a reading by a phototube.

1890. Brown, G. L.
Control of temperature and day length in glasshouses.
J. agric. Engng Res., 1960, **5**: 433-6.

In the system described temperature control was by hot water heating together with evaporative cooling by water-soaked pads, regulated by day and night thermostats and a time switch. Day length control was provided on a box-type bench. The light-tight boxes of aluminium-clad plywood were lighted by low-intensity incandescent lighting with a separate time switch control.—C.S.I.R.O., Canberra.

1891. Anon.
Die Nivola-Klimaheizung. (**The Nivola method of glasshouse heating.**)
Schweiz. Gärtnerz., 1960, **63**: 258-9, illus.

A short note on a new apparatus, developed by a Dutchman named Lestraden, for providing the optimum climate in a glasshouse. The arrangement consists of heating by coiled pipes placed centrally under the roof. From these pipes, under thermostatic control, steam is sprayed. A fan then comes into action and ensures even distribution throughout the house of air, air humidity and temperature. The temperature is found to be uniform even down to a depth of 20 cm. in the soil. Despite the moisture sprayed, the fan ensures that plant leaves dry at once and there is, therefore, no risk of fungal infection. The air movement also ensures satisfactory CO_2 supply. The heating coil can be connected to a hot water system provided the water is not too saline. The whole outfit is thermostatically controlled. Success has been achieved with azaleas, freesias, carnations, chrysanthemums, cucumbers, tomatoes and tropical ornamentals.

1892. Ministry of Agriculture, London.
Glasshouse heating systems.
Pumps and pipework for heatings systems.
Hort. Mach. Leafls Minist. Agric., Lond. **1**, 1960, pp. 8, illus., and **5**, 1960, pp. 6, illus.

1893. Ministry of Agriculture, London.
Boilers for nursery use.
Fuels and firing equipment for nurseries.
Hort. Mach. Leafls Minist. Agric., Lond. **2**, 1958, pp. 6, illus., and **4**, 1960, pp. 8, illus.

1894. Brandenburg, W., and Challenger, S.
Plastics for greenhouses and frames.
N.Z. J. Agric., 1960, **100**: 465-72, illus.
See *H.A.*, 30: 4813.

1895. National Institute of Agricultural Engineering.
Report on test of "Ganwick" sectional glass frames.
Rep. N.I.A.E. **241**, 1960, pp. 13, illus.
Double-span Ganwick frames were compared with single-span Dutch light frames for effects on soil temperatures, minimum night temperature at ground level and earliness of cropping. Records were taken of the time required to erect and dismantle. The Ganwick frames were not so effective as the unventilated Dutch light frames in raising the soil temperature in February and March, but in April and May they were almost as effective as Dutch lights with 1-in. ventilation and more effective than the latter with 2-in. ventilation. Tested on strawberries, they prevented frost damage and induced slightly earlier cropping than Dutch lights. They were capable of withstanding normal wind and snow without damage, were easily handled and glass breakage was negligible. Constructional details and dimensions are given with illustrations.

1896. Casini, E.
Mezzi per anticipare, ritardare e forzare la coltura degli ortaggi. **(Means of advancing, delaying and forcing vegetable crops.)**
Inf. Ortofruttic., 1960, **1**: 13-15, illus.
Including brief descriptions of inexpensive polythene-covered wooden frames, small and cloche-like for pricked-out cucumber seedlings, and extensive, with either continuous or sectional covers, for tomato nurseries.

1897. Ivanišin, A. I., and Turutin, Ju. P.
Experiments with the electrical heating of sheltered ground. [Russian, with English, German and French summaries 7 lines each.]
Vestn.s.-h. Nauki, 1960, **5**(6): 81-6, illus.
Slag concrete walls, 10 cm. thick and 30 cm. high, were built around beds 1 m. wide. Heating elements of 30–45 volts rating were installed along the inside of the walls. The heating was switched on at night and the beds were either covered during the night with sackcloth or tarpaulin stretched over the walls or were left uncovered; in some later experiments a permanent polythene cover was used. Both air and soil temperatures were greatly increased by this method; vigorous cabbage, tomato and cucumber seedlings were raised, and tomato plants grown in beds heated for 35 days gave twice the yield of the controls. The system is considered safe and economical under Eastern Siberian conditions.

TEMPERATE TREE FRUITS.

General.

See also 1685, 1686, 1862, 1875, 3542, 3557, 3558, 3561, 3610.)

1898. Felius, P. M., and Toorenaar, G.
De proeftuin te Wilhelminadorp. **(The experimental orchard at Wilhelminadorp.)** [English summary $\frac{1}{2}$ p.]
Jversl. Proefst. Fruit. Wilhelminadorp, 1959, pp. 17-25, illus.
In the first years of bearing Cox yields on M.XVI, with an interstock of M.IX, were positively related to length of interstock. Yields of Beurré Alexander Lucas on Quince A were higher on a long intermediate stock (60 cm.) of Beurré Hardy than on an interstock 10 cm. long. The reversal of a soil profile (a heavy silt loam above a coarse sand) increased yields of Crimson Cox by an average of 4 kg. per tree and of Golden Delicious by 22 kg. per tree. In the third year after planting yields of Cox and Golden Delicious grown as tree hedges were higher than from those grown as spindle bushes or regulated hedges. Shoot growth of Winston on M.IX was reduced by fruiting, the production of 1 kg. of fruit causing a reduction in total shoot growth of 82–90 cm. In trials of new apple varieties, Stark Earliest, Mantet, Ingrid Marie and Lobo showed promise.

1899. Green, W. J., Irish, A. E., and Mumford, D. C.
Cost of producing apples and pears in the Hood River Valley.
Stat. Bull. Ore. agric. Exp. Stat. **573**, 1960, pp. 52, illus.

1900. ANON.
Migliorare la coltura dell'albicocco. **(Better apricot growing.)**
Inf. Ortofruttic., 1960, **1**: 55, illus.

Notes on starting new orchards, with special reference to rootstocks.

Breeding and varieties.

(*See also* 1688, 1898, 1936, 1995, 2011, 3550, 3569, 3594.)

1901. WILLIAMS, W., AND BROWN, A. G.
Breeding new varieties of fruit trees.
Endeavour, 1960, **19**: 147-55, bibl. 14, illus.

A discussion of some modern methods and achievements.

1902. BALSGÅRD.
Föreningen för Växtförädling av Fruktträd. Verksamhetsåret 1959. **(Annual Report of Balsgård Fruit Breeding Institute for 1959.)** [English summary 4 pp.], 1960, pp. 32.

Breeding apples and pears for the production of late dessert varieties and for resistance to scab, mildew and *Gloeosporium*. Breeding cherries to produce late-ripening and large-fruited varieties. The production of hexaploid plums of the European type, and crosses between hexaploids and various oriental and American diploid plum species. Small fruit breeding includes work on strawberries, raspberries, blackberries and black currants. Some quince clones resistant to *Entomosporium maculatum* showed incompatibility with pear. *Prunus nigra* is being used as a rootstock for hexaploid plums. Raspberry varieties resistant to aphid vectors and to spur blight fungus, and cherries with field resistance to bacterial canker are being bred. In deep-freezing studies with raspberries it was found that contents of dry matter and ascorbic acid may be positively correlated with suitability for freezing. Mutation experiments include the use of chemical mutagens and ionizing irradiations.

1903. LÖHDEN, A.
25 Jahre Obstbauversuchsanstalt [Jork]. **(25 years' work at the Jork Fruit Research Station.)**
Mitt. Obstversuchsringes Jork, 1960, **15**: 179-80.

Current work consists primarily of testing tree forms and varieties, and of breeding, for the production of high yields and quality fruit under local conditions.

1904. BANGA, O. [EDITOR.]
10e beschrijvende rassenlijst voor fruitgewassen 1960. **(Tenth descriptive variety list of fruit crops 1960.)**
[*Publ.*] *Inst. Vered. Tuinbouwgew. Wageningen*, [1960], pp. 128, illus., fl. 2.

1905. CARLONE, R.
La scelta delle varietà nei nuovi impianti fruttiferi. **(The choice of varieties for new orchards.)**
Inf. Ortofruttic., 1960, **1**: 66-8, illus.

Apple, pear, peach, apricot, plum and cherry varieties recommended for the Italian province of Piedmont.

1906. CONSTANTINESCU, N., AND OTHERS.
Soiuri de cireş şi vişin bune pentru zona de silvostepă şi de măr, păr şi prun pentru zona subcarpatică meridională. **(Sweet and sour cherry varieties suitable for the forest-steppe region and apple and pear varieties for the southern sub-Carpathian region.)** [English, Russian, French and German summaries ¾ p. each.]
Grăd. Via Liv., 1960, No. 5, p. 34 + summaries.

Observations on 17 sweet and sour cherry, 25 apple, 18 pear and 20 plum varieties were made with reference to tree growth, dieback frequency, phenology, fruitfulness, insect and disease susceptibility, fruit quality and transport resistance. The varieties most suited to the respective areas are noted.

1907. GRUPPE, W.
Über den Ertragswechsel verschiedener Apfelsorten. **(On yield variations in certain apple varieties.)** [English and French summaries ¾ and ½ p. respectively.]
Gartenbauwiss., 1960, **25**: 33-45, bibl. 9.

Crop performance and yield variation during the first 10 years after planting were studied in 11 apple varieties on different Malling rootstocks in 4 experimental orchards. The biennial bearing index I and the factor B introduced by Hoblyn and others [*H.A.*, 6: 268] were included in the computation. Of the varieties tested James Grieve was distinguished by relatively high yields combined with small annual variations. Cox's Orange and Goldparmäne produced medium-high yields with medium-sized variations subject to a bearing habit that was more irregular than biennial. The performance is also discussed of the varieties Berlepsch, Ontario, Zuccalmaglio, Belle de Boskoop, Oldenburg, Landsberger Reinette and Kaiser Wilhelm. On M.IX yield differences were reduced in varieties that were otherwise liable to a higher degree of variation. It is suggested that in the evaluation of varieties and localities yield variations should be considered in addition to the absolute yields.—Inst. Obstb. Baumsch. tech. Hochsch. Hannover.

1908. (MCKENZIE, D. W.)
Five new apple varieties.
Orchard. N.Z., 1960, **33**: 140-1.

On the basis of trials at Havelock North, notes are given on the appearance, quality and keeping quality of the fruit and on the cropping capacity of Kidd's D.8 (a N.Z. hybrid), Spartan (a new Canadian variety), Idared (a new American variety), Seedling 77 (a local seedling) and Ames 512 (a new American hybrid).

1909. Dreiling, F. R., and Williams, G. R.
Apple varieties for Virginia.
Circ. Va poly. Inst. **849**, 1960, pp. 6, illus.

Notes on summer and early autumn varieties, new Red Delicious strains, autumn and winter varieties and promising new varieties.

1910. Breviglieri, N.
Il melo Delicious e le sue mutazioni gemmarie. (**The apple variety Delicious and its bud mutations.**)
Ital. agric., 1960, **97**: 1178-1208, illus.

Bud mutations from Delicious, Stark Delicious and Starking are described, with special reference to Starkrimson.

1911. Lott, R. V.
Some facts about early-red-coloring, Delicious-type apple varieties, with special reference to fruit characteristics.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 103-11, bibl. 3.

A brief description is given of 11 varieties derived from Delicious, all of which develop red colour earlier in the season. The varieties Okanoma, Starkrimson, Redspur and Wellspur exhibit a different type of vegetative growth from Delicious, characterized by short internodes and abundant fruit spurs and resulting in a smaller tree. Although red colouration develops early in the season, the fruit does not mature any earlier than Delicious.

1912. Anon.
Three new pear varieties.
Agric. Res., Wash., 1960, **9**(3): 16.

Magness and Moonglow are highly resistant, and Dawn slightly resistant, to pear blight.

1913. Casella, D.
Le varietà di albicocco diffuse nella Campania e nelle Puglie. (**Apricot varieties in Campania and Apulia.**)
Inf. Ortofruttic., 1960, **1**: 71-2, bibl. 1, illus.

For a fuller account, see *H.A.*, 28: 3293.

1914. Bargioni, G.
Contributo allo studio delle cultivar di ciliegio della provincia di Verona. (**Contribution to the study of the cherry varieties of Verona province.**) [English and French summaries 5 and 7 lines.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 103-28, bibl. 19, illus.

Brief notes on climate, soils, cultural practices (including grafting on *Prunus avium* and *P. mahaleb*) and diseases and pests are followed by phenological and biological information on 5 local varieties.—Ist. sper. Fruttic., Verona.

1915. (Buchanan, M.)
Two new cherries for the Northwest.
West. Fruit Gr, 1960, **14**(9): 25, illus.

Chinook and Rainier are high yielders, winter hardy, early bearing, virus free and larger and sweeter than Bing. Chinook ripens 4–10 days earlier than Bing and may extend the sweet cherry season by about 10 days. Rainier, a light coloured cherry, is suitable for canning and excellent for brining.—Irrig. Exp. Stat., Prosser, Wash.

1916. Tsiamos, N.
La coltura del pesco in Grecia e i suoi orientamenti. (**Peach growing in Greece and recent trends.**)
Inf. Ortofruttic., 1960, **1**: 103-4.

Notes on 12 established varieties and a list of 11 recently introduced.

1917. Havis, L.
Migliori varietà di pesche a polpa gialla. (**Improved peach varieties with yellow flesh.**)
Inf. Ortofruttic., 1960, **1**: 82-3, illus.

Notes on numerous varieties in the U.S.A.

1918. van Heek, L. A.
New canning peach varieties.
J. Agric. Vict., 1960, **58**: 439-45, bibl. 1, illus.

The characteristics of Tatura Sunrise, Tatura Dawn, Tatura Sunset and Tatura Aurora are described and compared with those of standard varieties.

1919. Anon.
Early peach variety.
Amer. Fruit Gr, 1960, **80**(11): 22 .

Earlired is a new, very early variety, with yellow flesh of good flavour and a cling to semi-cling stone.

1920. Morettini, A.
La Ruth Gerstetter, cultivar precoce di susino meritevole di considerazione. (**Ruth Gerstetter, an early plum variety worthy of consideration.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 271-6, bibl. 6, illus.

The possibility of fairly close planting and its early ripening compensate for this variety's comparatively low yield and lack of vigour.

Propagation and rootstocks.

(*See also* 1700, 1898, 1900, 1902, 1946, 1970, 1978, 1979, 2182, 3572.)

1921. Bluvštejn, I. N.
Increasing the output from fruit tree nurseries. [Russian.]
Sadovodstvo, 1960, No. 6, pp. 16-18, illus.

In the arid regions of the Crimea where the July–September period is particularly dry, better results were obtained with apple, pear, plum, peach, almond and apricot if the rootstocks were not earthed-up after budding. Earthing-up with hot dry soil caused the buds to dry out. Inserting 2 buds of cherry into mahaleb and of plum into cherry plum, at an interval of 15–20 days, and raising apple and pear grafts without a snag also improved the output of saleable plants.

1922. BUDAGOVSKIJ, V. I.
Raising dwarfing and semi-dwarfing rootstocks. [Russian.]
Sadovodstvo, 1960, No. 8, pp. 33-7, illus.

An account of the methods of propagation used in the U.S.S.R. for the dwarfing apple rootstocks Paradise VIII and IX and semi-dwarfing Doucin II, III and IV and the pear rootstocks quince A and C.

1923. SÄKÖ, J., AND MEURMAN, O.
Kestävien välirunkojen merkityksestä omenapuille. (**The significance of hardy framebuilders for apple trees.**) [English summary 1 p.]
Maatalous ja Koetoim., 1960, **14**: 171-81, bibl. 7, illus.

Hardy apple varieties which showed promise as intermediates were Hibernal, Sugar Miron, Huvitus and Mecca × Dolgo. Linda, Lobo, Melba, Patricia and Wealthy top-worked on hardy intermediates survived a severe winter well. It was shown to be possible to grow Gravenstein and Ingrid Marie in Finland by top-working them on hardy interstocks. Summer budding has given promising results in top-working trees.—Agric. Res. Centre, Piikkiö.

1924. ROY, P. O.
Behavior and yield records of McIntosh on different stem builders.
A.R. pomol. Fruit Growing Soc. Que., 1959, pp. 80-4.

See *H.A.*, 31: 228.

1925. BLACK, J. D. F.
Malling and Merton apple stocks.
J. Agric. Vict., 1960, **58**: 289-92, illus.

The vigour and cropping of 6 varieties on 9 Malling stocks were compared with the same varieties on the Merton stocks 778 and 793, S4 (a vigorous N.S.W. stock) and Northern Spy. In the eighth year from planting M.I, Northern Spy and Merton 793 were the heaviest yielding stocks with most varieties. Northern Spy, Crab C and S4 made the most vigorous trees with most varieties, the latter 2 stocks, however, being relatively unproductive in the eighth year. M.I and M.II produced the smallest trees with all varieties.—Hort. Res. Stat., Scoresby.

1926. FRITZSCHE, R., BRYNER, W., AND KOBLET, W.
Resultate aus Obstversuchsanlagen. Prüfung von Veredlungsunterlagen. (**Results obtained in experimental orchards. Rootstock tests.**)
Schweiz. Z. Obst- u. Weinb., 1960, **69**: 552-8, 574-80, illus.

In three places in Switzerland 96 trees of the apple variety Glockenapfel were planted as half-standards in 1938 to compare M.XII and M.XIII as rootstocks under different climatic and soil conditions. At the same time and with the same variety an orchard of pyramids on M.I, II, XII and XIII was planted as a parallel trial. In a comparison of the *stem circumference* there was initially little difference between trees on M.XII and XIII, but after 10–14 years trees on M.XII were smaller by 14, 7·5 and 3 cm. in the three places respectively. After 20 years the *crown spread* on M.XIII exceeded that on M.XII by 10–12%. After 23 years *shoot growth* on trees on M.XIII exceeded that of trees on M.XII by 79, 29 and 11% respectively. Pyramids responded to the two rootstocks in the same manner as did half-standards. Greater vigour was exhibited initially on M.I than on M.II, but during the main period of bearing trees on M.II were more vigorous than trees on M.I. *Yields* on M.XIII exceeded those on M.XII by 60 and 14% respectively, no records having been kept in the third place. In the pyramid orchard there was little difference in yields between M.I and II. Differences in *fruit quality* between trees on M.XIII and XII were small, but on several occasions the percentage of grade I fruit was higher on M.XIII.—Eidg. Versuchsanst., Wädenswil.

1927. MONIN, A.
Le pommier greffé sur SPG faible ou semi-vigoureux. La qualité des fruits. (**Apples grafted on dwarfing or semi-dwarfing rootstocks. Fruit quality.**)
Fruit belge, 1960, **28**: 113-22.

Fruit colour and soil cover were among the factors studied in a 3-year trial with James Grieve, Cox's Orange Pippin, Jonathan and Golden Delicious on M.II and M.IX. It was concluded that: (1) M.II necessitates a permanent sward; (2) a permanent sward makes it difficult to determine nutrient requirements accurately and necessitates the application of extra N; (3) semi-dwarfing rootstocks give the highest quality fruit with James Grieve, Jonathan and, possibly, Cox, but not with Golden Delicious as the fruits remain too green.

1928. KRÄNZLE, T.
Zusammenpflanzung von Sorten/Unterlagenkombinationen ähnlicher Wuchsstärken. (**The planting in one orchard of variety/rootstock combinations of similar vigour.**)
ErwObstb., 1961, **3**: 10-11.

Recommendations on the spacing of 15 apple and 13 pear varieties as spindle bushes and bush trees on various rootstocks.

1929. BROSSIER, J.
I problemi posti dalla selezione del cotogno. (**Problems connected with the selection of quinces.**)
Inf. Ortofruttic., 1960, **1**: 114-19, illus.

Classification of varieties is discussed, and the rooting capacity of cuttings and marcots of the Angers and Provence types is compared. When 5 pear varieties were shield-budded on various quince rootstocks, one of the latter proved totally incompatible with Passe Crassane, the rootstock dying in spite of the graft union being perfect. Cold-resistant quince clones have been selected from the German variety Pillnitz. Problems of virus resistance and lime-induced chlorosis are discussed.

1930. Hildebrandt, W.
Keimungsphysiologische Studien an Steinobst. II. Über den Einfluss der Stratifikationstemperatur auf Nachreife und Keimung verschiedener Steinobstarten. **(Studies on the physiology of germination in stone fruits. II. The effect of the stratification temperature on after-ripening and germination in different species of stone fruit.)** [English and French summaries ½ p. each.]
Gartenbauwiss., 1959, **24**: 411-29, bibl. 13.

The effect of different temperatures of stratification ranging from 0° to 20° C. was studied in relation to the after-ripening and germination of stone fruit seed. Cherries (*Prunus mahaleb*, mazzards and sweet cherry varieties) were found to respond very well to a constant temperature of 6–12° C., with an optimum of 6–8° C. in the case of *P. mahaleb*. Peaches, myrobalans and mirabelles responded well to 8–12° C., with optima at 10° and 12° C. for peaches and myrobalans respectively. In the case of peach, *P. mahaleb* and sweet cherry periodically alternating temperatures achieved the same results as constant temperatures, but mirabelles and myrobalans did not respond to the former. With mazzards, however, germination was enhanced by periodical changes of temperature. With mirabelles, myrobalans and peaches a brief period of high temperature treatment at 20° C. appeared to have a slightly stimulating effect on germination. [For part I see *H.A.*, 30: 3263.]—Inst. Obstb. Baumsch. tech. Hochsch. Hannover.

1931. Hildebrandt, W.
Keimungsphysiologische Studien an Steinobst. III. Die Feuchtigkeitsaufnahme des Steinobstsaatgutes bei der Quellung und der Einfluss der Feuchtigkeit auf die Keimung. **(Studies on the physiology of germination in stone fruits. III. The absorption of moisture by stone fruit seed on soaking and the effect of moisture on germination.)** [English and French summaries ¾ p. each.]
Gartenbauwiss., 1960, **25**: 15-32, bibl. 12.

(1) One year's dry storage of stone fruit seed at +3° C. and R.H. 80–85% produced only minor changes in the moisture content. (2) On soaking, characteristic saturation curves were obtained, as well as graduated differences between individual species in respect of water absorption. Cherries and peaches, showing a high rate of absorption, reached their maximum values after approximately 48 hours, while myrobalans and mirabelle varieties, showing a lower rate of absorption, reached the same maximum values only after 72 hours. (3) During stratification the moisture content of the kernels remained constant until the shells ruptured. Rupture occurred only in kernels with a medium rate of moisture absorption. (4) Stony shells and seed coats greatly inhibited water absorption, the extent of which was also affected by variety, origin and age of seed. The weight of the kernel did not seem to have any effect. (5) The temperature during soaking influenced the rate of moisture absorption but not the germination capacity. In view of the fact that losses from kernel rot increased with temperature, a soaking temperature of 10° C. is recommended. (6) Treatment with concentrated sulphuric acid did not affect moisture absorption. (7) The duration of soaking did not affect germination significantly. Myrobalans showed optimum germination after 72 hours' soaking and peaches after 24 hours. (8) With myrobalans an increase in the moisture content of the stratification medium was associated with a decrease in the percentage of ruptured and germinated kernels.—Inst. Obstb. Baumsch. tech. Hochsch. Hannover.

1932. Muhanin, V. G.
Grafting cherries early in the year. [Russian.]
Bjull. nauč.-tehn. Inf., Mičurinsk, 1959, No. 8, pp. 55-9.

Experiments in 1957 showed that cherries grafted between 23 June and 12 July suffered less winter damage than those grafted later.

1933. Rowe, R. N.
The search for "wet-resistant" peach rootstock.
J. Agric. Vict., 1960, **58**: 292-3.

Myrobalan and Marianna plum stocks were found to be incompatible with Beale and Smith peach varieties. Up to 4 years after planting, the same peach varieties on Brompton, Damas C, St. Julien and Ackermann were equally as vigorous and high yielding as trees on peach seedlings. Experiments have established that peach roots, when they decay, release HCN and it is thought this may be the cause of tree death following waterlogging.—Hort. Res. Stat., Scoresby.

1934. Hilkenbäumer, F., and May, W.
Das Verhalten wurzelechter Mirabellen. **(The behaviour of mirabelles on their own roots.)**
ErwObstb., 1961, **3**: 13-14, bibl. 1, illus.

As with damsons, the propagation of mirabelle clones on their own roots derived from suitable mother trees had several advantages over rootstock-scion combinations: they were more tolerant of less favourable environmental conditions and their growth and cropping were more uniform. Delayed bearing of the more vigorous trees on their own roots was soon compensated for by higher yields. The experiments were carried out in calcareous loess soils and in lime soils.

Climatic factors.

(*See also* 1950, 2305.)

1935. Mowry, J. B.
Attractiveness of apple varieties.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 111-23, bibl. 10.

Fruit of 64 varieties from 21 places in the U.S.A. was rated for skin colour and attractiveness in 4 seasons. There was a tendency for average absolute humidity to have a greater effect than average temperature. Distribution of temperature throughout the growing season was of some importance, low temperatures in the late summer months resulting in more attractive fruit than high temperatures in late summer. The Turley and Winesap varieties were uniformly coloured from regions with different climatic conditions. Golden Delicious and Idared showed a marked response to high humidity by developing prominent dots on the skin.

1936. Kofler, A.
Erfahrungen über Standort- und Pflegeansprüche von Golden Delicious. (**Observations on the requirements of Golden Delicious in respect of locality and management.**)
ErwObstb., 1961, **3**: 11-12, illus.

In the Southern Tyrol the high relative humidity in valley locations was conducive to rough skin.

1937. Steckel, W.
Temperatur und Ertrag. (**Temperature and yields.**)
ErwObstb., 1961, **3**: 14-16, bibl. 2.

See *H.A.*, 31: 266.

1938. Boynton, D.
Observations on the temperature limitation of the apple in tropical America.
Proc. Carib. Reg. Amer. Soc. hort. Sci. 1959, 1959, **7**: 69-88, bibl. 16, illus.
La temperatura como factor limitante en el cultivo del manzano en la América tropical. (**Temperature as a limiting factor in the cultivation of the apple in tropical America.**) [English summary 12 lines.]
Turrialba, 1960, **10**: 17-27, bibl. 16, illus.

The climatic factors which may affect the success of the Delicious apple in the tropics are discussed. It is considered that success can be related to the monthly mean maximum and minimum temperatures in the 4 coldest and the 4 warmest months of the year.—Cornell Univ., Ithaca, N.Y.

1939. Yasunobu, Y.
The influence of winter temperature on the flowering of several deciduous fruit trees. [Japanese, with English summary ⅓ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 16-20.

Observations on peaches, Japanese pears and persimmons, made over a period of 9 years, showed that higher temperatures from January to March hastened the beginning of blossoming, which in peaches varied over a period of 17 days and in persimmons and Japanese pears over 11 days.

1940. Crescimanno, F. G.
Risultati di ricerche sulla cascola delle gemme nel pesco, in relazione al fabbisogno in freddo. (**Results of investigations on peach bud drop in relation to cold requirement.**) [French and English summaries ⅓ p. each.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 129-42, bibl. 21, illus.

In a 3-year investigation on the effects of winter temperature on the prolonged dormancy of peach, characterized by bud drop, the average annual bud drop was 82% in Mayflower, 79% in Amsden, 67% in Early Rose, 55% in J. H. Hale and 44% in Morettini. Except for a few hours below 7° C. in 1957-58 and 1958-59, the minimum temperature was in general about 10° C.—Ist. Colt. arb., Univ. Palermo.

1941. Wilner, J.
Relative and absolute electrolytic conductance tests for frost hardiness of apple varieties.
Canad. J. Plant Sci., 1960, **40**: 630-7, bibl. 10, illus.

Using the finding [reported in *H.A.*, 30: 179] that the diffusion of electrolytes from frost injured twigs was much higher than from control plants, the relative degree of hardiness and the absolute values for the frost resistance of the varieties Antonovka, McIntosh and Northern Spy were determined. Although the total conductance of electrolytes of the 3 varieties was about the same before the artificial freezing treatments, ranging from 900 to 1,000 micromhos, the average survival and the conductance of diffused electrolytes were as follows: hardy Antonovka 71% and 296 micromhos; less hardy McIntosh 53% and 445 micromhos; and least hardy Northern Spy 23% and 611 micromhos. The results also established quantitative values for the ultimate frost hardiness, namely: no appreciable injury when the conductance from hardened tissues of twigs was within 200 to 250 micromhos or less. Conductance of electrolytes above 350 to 450 micromhos generally signified total killing, whereas intermediary readings indicated partial injury to twigs. [From author's abstract. See also *H.A.*, 31: 257.]—Canada Dep. Agric., Ottawa, Ont.

942. Pisek, A., and Eggarter, H.
Beobachtungen zur Überwindung von Frostschäden an Zweigen und Laubknospen von Apfel und Birne. (**Observations on the recovery from frost injuries of shoots and leaf buds of apple and pear.**) [English and French summaries 17 lines each.]
Gartenbauwiss., 1959, **24**: 446-56, bibl. 16, illus.

One-year-old apple and pear shoots cut off from the tree were frozen experimentally in early spring and then forced in the glasshouse or grafted to make observations on the development of vegetative buds and shoots damaged by frost. Further, in order to study the regeneration of frost-injured tissues, 20–30 cm. lengths of older shoots remaining on the tree were treated with an ice-salt mixture covered by a plastic film. It was found that vegetative buds may develop normal shoots if the growing point and the innermost (youngest) leaf primordia remain intact. If a bud is killed by frost, a meristem may be formed below the injured part in the parenchyma which is enclosed by the cambial cone of the bud basis, and from here a very short shoot with a terminal bud will develop. This subsidiary shoot penetrates the basis of the original bud either in the autumn of the same season or during the next growing period. In shoots, as in leaf buds, regeneration is initiated by the cambium which is the most resistant tissue in winter. Where the cambium survives—be it only one-third to one-quarter of the entire ring—and has a living connection with the interior tissues, new bast and wood growth is produced, however severe the injury may be in other respects.—Bot. Inst. Univ. Innsbruck.

1943. Kruglova, A. P.
The winter hardiness of stone fruits along the Volga near Saratov. [Russian.]
Bjull. nauč.-tehn. Inf., Mičurinsk, 1959, No. 8, pp. 22-6.

Tables show the relative hardiness of 26 varieties of cherry, 20 varieties of plum and 4 varieties of apricot.

1944. Kalašnikova, N. I., and Kirillov, N. I.
Self-protecting orchards. [Russian.]
Sadovodstvo, 1960, No. 8, pp. 27-30, illus.

In the Tambovsk province bush apples planted at 5 different spacings, from 6 × 2 m. to 6 × 7·5 m., were compared with others spaced at 8 × 6 m. and a commercial orchard of half-standards spaced at 10 × 8 m. Around all the plots shelter belts were planted. The close spacings resulted in very good retention of snow cover and moisture from thaw water, good shoot growth, early wood maturity, high frost resistance and high yields per unit area. In some cases increased fruit size and colour were noted, and at planting distances of 6 × 4 m. and in double rows at 8 × 3 × 3 m. a reduction in biennial bearing occurred.

1945. Ferguson, J. H. A.
A comparison of two planting systems in orchards as regards the amount of radiation intercepted by the trees.
Neth.J.agric.Sci., 1960, **8**: 271-80, bibl. 2, illus.

The investigation was carried out by photographing wooden cones of height 4·5 cm. and base diameter 3 cm., placed on boards to represent trees 4½ m. high, (*a*) 3 m. apart in single rows 4½ m. apart, and (*b*) 4 m. apart in double rows alternately 2½ and 4½ m. apart, each tree being opposite a gap in the next row (triangle-row system). In (*a*) the orientation was far more important than in (*b*), E.–W. rows being highly advantageous in September. On the whole, the radiation received per tree was 1·3% higher in (*b*) than in (*a*). A simple method is described of estimating orchard shadow areas by cutting out and weighing tree shadows plotted to scale on paper.—Inst. hort. Pl. Breeding, Wageningen.

1946. Blasse, W.
Beobachtungen über die Trockenresistenz von Äpfeln auf verschiedenen Unterlagen im Sommer 1959. (**Observations on the drought resistance of apples on different rootstocks in the summer of 1959.**) [Russian and English summaries 18 and 15 lines respectively.]
Arch. Gartenb., 1960, **8**: 441-52, bibl. 6, illus.
Zur Trockenresistenz von Äpfeln auf verschiedenen vegetativ vermehrbaren Unterlagen im Jahre 1959. (**The drought resistance of apple varieties on different clonal rootstocks in the year 1959.**)
Dtsch. Gartenb., 1960, **7**: 190-2, bibl. 6, illus.

The response is recorded of several apple varieties, grown under similar conditions and each worked on a number of rootstocks, to the exceptional drought in the summer of 1959. The degree of drought susceptibility was estimated by the extent of premature leaf fall in mid-July. The resistance of the varieties declined in the following order: Ontario, Goldparmäne, Berlepsch, Cox's Orange and Boskoop. On the whole varieties on Malling rootstocks showed the least leaf drop and those on Dab rootstocks (selections from *Malus baccata* × *M. prunifolia*) the most, Da rootstocks (selections from *Malus communis*) being intermediate. Flowering in the middle of August was observed in the varieties Boskoop and Goldparmäne, largely in combinations with Dab rootstocks, 5 weeks after a severe leaf drop.—Inst. Obstb. Humboldt-Univ. Berlin/Marquardt b. Potsdam.

Soil management and irrigation.

(*See also* 1868, 1869, 1898, 2181, 2333, 3580, 3591, 3599).

1947. Baxter, P.
Apfelnachbau in bodenmüdem Land. (**Replanting apples in sick soil.**)
ErwObstb., 1961, **3**: 1-2, bibl. 2, illus.

Soil sickness in the nursery was cured by DD treatment before planting.

1948. Witte, K.
Auswirkung unterschiedlicher Untergrundlockerung in unverdichteten Böden bei Birnen. **(The effects of different methods of subsoil loosening in non-compacted soils before planting pears.)**
ErwObstb., 1961, **3**: 3-5, bibl. 2, illus.

The following methods of soil preparation were used when 4 pear varieties on quince were planted in 1941: (1) ploughing 25 cm. deep, no subsoil loosening; (2) hand trenching 1 m. deep; (3) digging of planting holes of 1 cubic m.; (4) blasting of planting holes. After 20 years no significant difference was found between treatments in respect of shoot growth, yield and root formation. Irrespective of method of soil preparation root growth was shallow, not extending below approximately 40 cm. Where there is some soil compaction subsoiling to a depth of 40 cm. is recommended before planting.—Versuchswirt. Marhof, Bonn Univ.

1949. Kuretani, M.
Studies on increasing soil productivity in sloping orchards. II. Effects on the physical and chemical properties of the soil and on the growth of young peach trees of intermixing pond muds at various rates. [Japanese, with English summary ⅓ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 286-94, bibl. 22, illus.

The addition of pond mud to soils of granite origin decreased acidity, increased water-holding capacity and improved the vegetative growth of peach trees, particularly when added to the soil surface rather than being mixed with the soil. [For part I see *H.A.*, 25: 2481.]

1950. Kurokami, T., and others.
Co-operative studies on the establishment of sloping orchards. I. Introduction. II. Ecological studies on fruit trees cultivated in sloping orchards. III. Studies on the management of sloping orchards. IV. Studies on soil conservation in sloping orchards. V. Micro-meteorological studies on the establishment of sloping orchards. VI. Soil studies in newly established sloping orchards. VII. Ecological studies on deeply cultivated peach orchards located on diluvial upland soil. VIII. Ecological studies on young citrus orchards on sloping land under permanent grass. [English summary to each section.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 301-439, bibls, illus.

The soil moisture content varied according to the position on the slope, and the growth of the fruit trees was greatly influenced by this factor. The use of cover crops decreased soil moisture. The adaptability of fruit trees to sloping land and the costs of establishing an orchard are discussed. The best protection against erosion by heavy rainfall was obtained in a peach orchard by double terracing. The underground temperature of bare earth decreased as the angle of elevation increased. The evaporation from reclaimed ground was greater than that from unreclaimed ground on both north and south slopes throughout the year; the soil humidity in all cases was higher at night than during the day, especially in the spring. The addition of reservoir deposits to the soil of the middle slopes increased the N content but did not affect the water-holding capacity, clay content, specific gravity, bulk density or porosity. The addition of reservoir deposits to the lower slopes increased the carbon content of the soil. Soil moisture content was higher on diluvial upland than on alluvial soil. The leaf water content of peach trees was higher on alluvial than on diluvial soil but N and total sugar contents and specific gravity were higher on diluvial than on alluvial soil. The effects of the physical properties of the soil were more marked on diseased than on healthy peach trees. Early defoliation on volcanic ash soil was thought to be caused by Ca and Mg deficiencies. A comparison of a clean-cultivated Satsuma orange orchard with an orchard cover-cropped with ladino clover showed that the soil moisture content was lower in the cover-cropped plot but that there was an improvement in the physical properties of the soil. Tree growth was greater and leaf N content was higher on the cover-cropped area but fruit enlargement was retarded. Evaporation from the soil in a high wind was lower when a cover crop was present.

1951. Engel, G.
Der Einfluss verschiedener Bodenpflegemassnahmen auf das Klima im Obstbestand und auf die vegetative und generative Entwicklung der Obstgehölze. **(The effect of different soil management practices on the climate of the orchard and on the growth and cropping of the fruit trees.)** [English and French summaries ¾ p. each.]
Gartenbauwiss., 1960, **25**: 67-106, bibl. 87.

The experiments were carried out from July 1957 to June 1959 with 4-year-old apple spindle bushes of the varieties James Grieve and Cox's Orange on M.IX and M.IV near Bonn, where the annual rainfall averages 600 mm. The 3 treatments compared were: clean cultivation, permanent straw mulch and a cover crop of mustard in summer. The following results were obtained: (1) The structure of the soil, as judged by its porosity, was satisfactory in all 3 plots. (2) The most intense absorption of solar radiation by the surface of the soil occurred under straw, the bare soil absorbing least and the soil under mustard being intermediate.

Consequently, the daily curves of the air temperature showed the most extreme values over the straw cover; the curves of relative humidity exhibited only small differences from each other, except during the hours around noon. (3) In respect of soil temperature, the annual and daily variations were smaller and the mean value was lower under straw than in the clean cultivated soil. Under mustard the temperature conditions were similar to those of the clean cultivated soil. The soil moisture curve, too, was less extreme and the soil moisture content was higher under straw than in the two other plots. From the beginning of August to the beginning of September the moisture content of the soil was lower under mustard than in clean cultivated soil. (4) Bud burst and termination of growth were not affected by the different methods of soil management. With James Grieve an effect of the treatments on the vegetative growth did not appear until the third year, and with Cox's Orange until the second year. Tree growth was stimulated most under the straw mulch, and the performance of trees under the cover crop was better than that in clean cultivated soil. (5) The effect of the treatments on cropping was also delayed. Straw significantly increased flower bud formation in comparison with the other two treatments; it also induced earlier flowering which was, however, accompanied by greater danger of frost damage. (6) Yields were higher on the straw and mustard plots than on clean cultivated soil. These higher yields were due both to a greater number of fruits per tree and to a greater weight per fruit. The quality of the fruits on the straw-covered plot was consistently better than that on the other two plots. (7) Factors conducive to an improvement of growth and cropping are considered to be: (i) an extreme variation in the daily curve of the air temperature, and (ii) a constant and relatively high soil moisture content.—Inst. Obstb., Univ. Bonn.

1952. Simons, R. K.
Orchard soil management for apples and peaches.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 57-64.

A comparison of the effects upon the organic C content of the soil of 4 cultural practices, maintained in an apple orchard for 4 years, showed that the greatest increase was produced by an unmown grass cover. Soils under mown grass had a much lower organic C content and culticutting, or mowing as well as culticutting, produced intermediate effects. Clean cultivation of peach orchards, even with a winter crop of rye disked in in May, reduced the organic C content of the soil.

1953. Butijn, J.
Het bodemkundig onderzoek. **(Soil studies.)** [English summary ½ p.]
Jversl. Proefst. Fruit. Wilhelminadorp, 1959, pp. 33-41, illus.

In the dry growing season of 1959 N deficiency symptoms were frequently observed in apple orchards; on soils that tended to dry out trees showed premature defoliation and bark splitting. Deep cultivation improved rooting and increased the resistance of the trees to drought. *Soil management*. In a grass orchard there was considerable mortality of trees, particularly when the N supply was low. In another orchard there was little difference in tree condition or yield between plots mown once or twice a month. Pear trees growing in clean cultivated strips with grass between the rows showed good growth in the first year. *Mineral nutrition*. Leaf shedding from the middle of the shoots in young Cox plantations was associated with leaf deficiencies of N and Mg. Midsummer leaf-fall of Golden Delicious was less serious than in previous years, and observations indicate that such leaf shedding will not occur when leaf N is low. Leaf analyses have shown that high yields are related to a high N content of the leaves.

1954. Mathews, C. D.
The mowing of grassed orchards.
Tasm. J. Agric., 1960, **31**: 145-51, illus.

The main requirements of an orchard mower and the advantages and disadvantages of 5 types are discussed.

1955. Mauri, —
Hedelmätarhoihin nurmi-kompostit. **(Grass mulch in orchards.)** [English summary 3 lines.]
Puutarha, 1960, **63**: 359-60, illus.

The best method of soil management in Finland.

1956. Eggert, F. P.
Fertilization of apples.
Me Fm Res., 1960, **8**(2): 36-8, illus.

Results of treatments over a 10-year period with various combinations of N, P and K fertilizers, mulches and stable manure showed that average yield increases of 50 bushels/acre/year were obtained with an annual application of 200 lb. per tree of good hay or straw mulch plus chemical fertilizers.

1957. Kuryndina, T. I.
The use of herbicides in fruit orchards. [Russian.]
Bjull. nauč.-tehn. Inf., Mičurinsk, 1959, No. 8, pp. 50-5.

The Na and NH_4 salts of trichloroacetic acid at 32 kg./ha., DNOC at 10 kg./ha., maleic hydrazide at 30 kg./ha., 2,4-D at 2 kg./ha. and CIPC at 16 kg./ha. were sprayed round the base of wild apple seedlings in the nursery and were found not to reduce shoot growth compared with the unsprayed controls. In bearing orchards DNOC, MH, TCA and petroleum oil have given good weed control.

1958. Farmer, A.
Split stone of peaches in N.Z.
Orchard. N.Z., 1960, **33**: 146-7, bibl. 4, illus.
Symptoms of the condition are described and possible causes discussed. Maintenance of an adequate and even supply of soil moisture up to and through the stone-hardening period is recommended to reduce incidence in susceptible varieties, which include the very early N.Z. varieties Le Vainqueur and Mayflower.—D.S.I.R., Auckland, N.Z.

1959. O'Grady, L. J.
Orchard irrigation.
Summary in *A.R. pomol. Fruit Growing Soc. Que., 1959*, p. 78.
When irrigation was carried out during a drought to maintain 80% available water at a 12-in. depth, the yield of Early Red, Close and Melba apples 2½ in. or more in diameter was increased by 46% and the total yield was almost doubled. The total yield of McIntosh apples was increased by only 12%. When the drought ended, the fruit on the non-irrigated plots increased in size rapidly. It is concluded that irrigation during a drought is only profitable with early varieties.

1960. Bennett, W. A.
Drag line irrigation.
West. Fruit Gr, 1960, **14**(8): 5-6, illus.
The system consists of hydrant valves below the ground with 8-in. concrete pipes over them, flush with the ground, for protection against farm machinery. The drag line laterals are made of 2-in., 14-gauge steel pipes, 440 ft. long, and are designed to operate for 12 hours at each set, after which they are connected to the draw-bar of a jeep and moved up 1 row. The semi-dwarf apple trees which have been successfully irrigated by this method are planted in 28½ foot squares in the orchards.—Soil Conserv. Serv., Okanogan, Wash.

Nutrition and tree composition.

(*See also* 1805, 1950, 1953, 1956, 2022-2024, 2176, 3125, 3565, 3569, 3577, 3607.)

1961. Liwerant, J.
Effets des principaux éléments fertilisants sur le développement végétatif et sur la production du pêcher. (**Effects of the main nutrient elements on the growth and fruiting of the peach tree.**) [English, German and Russian summaries ½ p. each.]
Ann. agron., Ser. A, 1960, **11**: 93-111, bibl. 10, illus.
See *H.A.*, 30:3309.

1962. Titus, J. S.
The effect of nitrogen fertilization on the biennial bearing of the Golden Delicious apple.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 50-4, bibl. 4.
In an experiment with 3 levels of N fertilization, 0·5, 1·0 and 4·0 lb. ammonium nitrate per tree, on 14-year-old trees, the biennial bearing index $\left(\frac{\text{difference between 2 yields}}{\text{total of 2 yields}} \times 100\right)$ increased from 20·0 at the low rate of N fertilization to 47·0 with the medium application and to 69·5 at the high rate.

1963. Mochizuki, T., and Hanada, S.
The effect of nitrogen on the formation of the anisophylly on the terminal shoots of apple trees.
Soil Plant Food, 1958, **4**: 68-74, bibl. 4, illus.
Areas of individual leaves on apple shoots often show two maxima, one at about leaf 9 and another at leaf 17, with a small leaf at about the thirteenth position. In some Ralls trees not fertilized with N leaf area and leaf N content were reduced more severely in the positions beyond the small leaf. Shoot length was reduced in the absence of N fertilization, entirely as a result of reduced internode length above the position of the small leaf. It is suggested that the development of the leaves proximal to the small leaf is related to the N reserves within the tree and that of the leaves distal to it is related to the added fertilizer N. [See also *H.A.*, 29:111.]—Hirosaki Univ., Japan.

1964. Gruppe, W.
Zeitliche Veränderungen im Gehalt an Makroelementen in Einzelblättern einjähriger Apfellangtriebe bei unterschiedlicher Stickstoffdüngung. (**Seasonal changes in the content of macronutrients of individual leaves from one-year-old apple shoots associated with differential nitrogen applications.**) [English and French summaries 16 and 10 lines respectively.]
Gartenbauwiss., 1959, **24**: 430-45, bibl. 26.
The N, P, K, Ca and Mg contents of individual leaves from annual shoots of Cox's Orange trees on M.XI were determined at monthly intervals from May to September, the trees having been supplied with 60, 100 and 140 kg. N per hectare. Graphs show the growth rate of the shoots, the dry matter content of the shoots and leaves and the leaf area of the shoots. Positional and seasonal changes in the nutrient element content are also expressed graphically. All the data obtained were interpreted in relation to the supply of mineral nutrients, the effect of N manuring, the different rates of growth in individual seasons and the age of the leaves analysed. It was found that the differential manuring produced the greatest differences in the macronutrient content of the leaves at the end of September. Leaves from the middle of the shoot were shown to be the most suitable for sampling.—Inst. Obstb. Baumsch. tech. Hochsch. Hannover.

1965. VAN DER BOON, J., AND POUWER, A.
The effect of nitrogen fertilisation and certain other factors on the chemical composition of apple leaf.
Neth. J. agric. Sci., 1960, **8**: 317-27, bibl. 51.

A 5-year experiment with Jonathan apple trees is described and the results are analysed in detail. The 4 levels of applied N ranged from 100 to 310 kg./ha. annually, and an increased application of N resulted in higher percentages of N and Mg, and lower percentages of K, P and Ca in the leaves. Except for Ca and sugar, the results were in accordance with those recorded in the literature. In this experiment the sugar content did not fall with increased N application. The effects of "growth dilution", N source, cation absorption capacity of the roots, rainfall and crop yield on leaf composition are discussed.—Inst. Soil Fertility, Groningen, and Hort. adv. Serv., Kesteren.

1966. REINKEN, G.
Über die Aufnehmbarkeit von Monocalcium- und Dimagnesiumphosphat für Apfelbäume. **(On the uptake of monocalcium- and dimagnesiumphosphate by apple trees.)** [English and French summaries ⅓ p. each.]
Gartenbauwiss., 1960, **25**: 46-52, bibl. 24.

Two years' experiments were carried out on young apple trees of the variety Zuccalmaglio on M.XI grown out-of-doors in large containers. With the aid of leaf analyses it was found that P is more easily absorbed from dimagnesiumphosphate than from monocalciumphosphate, magnesium having a "carrier" effect. The effects of the fertilizers on growth, transpiration, dry matter formation and Mg, P, K and Ca uptake are discussed.—Inst. Obst. Rhein. Friedrich-Wilhelms-Univ., Bonn.

1967. SEDOV, E. N.
The use of phospho-potassic fertilizers during the raising of hybrid seedlings of apples and pears. [Russian.]
Bjull. nauč.-tehn. Inf., Mičurinsk, 1959, No. 8, pp. 32-5.

The use of P and K fertilizers increased the growth and physiological activity of seedlings of 7 families. Photosynthetic activity and transpiration rate of the treated seedlings were increased, as was the moisture content of the leaves.

1968. BEYERS, E.
The use of nutrient sprays.
Dec. Fruit Gr, 1960, **10**: 155-60, illus.

Recommendations for the use of urea and minor element sprays on deciduous fruit trees, citrus and vines.

1969. CANDUSSIO, R.
Relazione sull'attività svolta dall'Istituto Chimico Agrario Sperimentale nel biennio 1957-1959. **(Report on the work of the Institute of Experimental Agricultural Chemistry [Gorizia] in the two years 1957-1959.)**
Pubbl. Ist. chim. agrar. sper. Gorizia, Ser. 2A, **13**, 1959, pp. 113, bibl. 12.

The bulk of the report concerns soil analyses and the nutrition of lucerne, wheat and sugar beet. The section on iron-deficiency chlorosis of fruit trees gives information on the degree of susceptibility of 13 varieties of peach, 8 of pear and 9 of apple to this chlorosis. Affected pear trees responded best to Na Fe EDTA when this was applied both by injection into the soil in early and late summer at 100 g. per tree and as a 0·1% foliar mist spray several times from May onward, but each method used alone had a considerable effect. In no case was the return of normal colour in the leaves accompanied by renewed general health of the tree. Applications of K and B proved beneficial. Peach trees did not respond well to these chelate treatments, either on calcareous or on ferretto soils [leached soils rich in Fe-Al sesquioxides]. Experiments with other Fe chelates are in progress.

1970. KOČEV, H.
Chlorosis of trees on the Danube plain. [Bulgarian, with Russian and German summaries 3½ pp. each.]
Izv. bot. Inst. Sofia, 1960, **7**: 37-105, bibl. 58, illus.

Of 72 species investigated 19, mainly fruit and nut trees, vines and some ornamentals, were found to be affected by lime-induced chlorosis. The fruit of the chlorotic trees was small with an unusual flavour and reduced sugar content. Where the disorder occurs only in mild form, applications of iron sulphate and organic manure are recommended. Before establishing new orchards soil analyses should be made and only suitable varieties planted on chlorosis-resistant rootstocks such as wild apple, wild pear and *Prunus mahaleb*.

1971. DICKENS, L. E., HENDERSON, W. J., AND ALTMAN, J.
Chemical control of peach tree chlorosis.
Plant Dis. Reptr, 1960, **44**: 317.

About 7 weeks after the application of Sequestrene 138 Fe, Sequestrene 330 Fe and Versenol F at 1½ lb. per tree in 14-ft. bands in the irrigation furrow on each side of the tree, the foliage was 99·8, 66·0 and 97·8% free from chlorosis respectively, compared with 100% severely chlorotic in the control.—Colo. St. Univ., Fort Collins.

1972. Gruppe, W.
Die Bedeutung der Blattanalyse für die Düngung im Obstbau. **(The importance of leaf analysis in fruit tree manuring.)**
ErwObstb., 1960, **2**: 198-201, 218-22, bibl. 25.

The author gives a general survey of the basis of leaf analysis and its possible application in practical fruit growing. He considers that leaf analysis gives a very good idea of the response of the nutrient status within the tree to the various environmental conditions. In practice leaf analyses may be used to determine nutrient element deficiencies, to regulate fertilization in the orchard and to predict fruit quality in storage.—Inst. Obstb. Baumsch., Sarstedt, Hannover.

1973. Trzcinski, T.
Niveaux critiques dans l'appréciation de l'état de nutrition des pommiers. **(Critical levels in the estimation of the nutritional status of apple trees.)**
Rev. Agric., Brux., 1960, **13**: 349-53, bibl. 17.

A short review of the literature on critical leaf levels of major and minor elements.

1974. Kamal, A. L.
The effects of some insecticides and 2,4-D ester on the nitrogen fractions of Bartlett pear leaf and stem tissues.
Diss. Abstr., 1960, **21**: 412, being *L.C. Card No. Mic.* 60-2705 of 75 pp.

Total and protein N contents of spur leaves were not affected by dormant applications of oil or lime sulphur when applied separately, but both fractions were significantly increased after a combined application. In some cases DDT and malathion significantly increased total and protein N fractions in leaf tissue; parathion and systox had only limited effects. The effects of the insecticides on the soluble N fractions were not consistent. Trees given 3 sprays of 2,4-D at 4 p.p.m. in July and August of one year did not show visible injury until the following year. Injury was apparent in the same year when trees were sprayed with 1 application of 16 p.p.m. 2,4-D in June, or 4 applications of 8 p.p.m. each in June and July. Changes in leaf N contents were associated with leaf injury. There was, in general, an increase in the total and protein N in the leaf but a decrease in these constituents in the stem. Soluble N in young leaves and amide N in old leaves were decreased by all 2,4-D treatments. There was no effect on the amino N fraction of leaf and stem tissues. The other results of the 2,4-D treatments on soluble N constituents were inconsistent.—Wash. St. Univ.

Growth and physiology.

(*See also* 1759, 1858, 2306, 2307, 2962, 3565.)

1975. Liard, O.
L'étude de la "valeur culturale" des espèces et variétés fruitières. **(A study of the "cultural value" of fruit species and varieties.)**
Rev. Agric., Brux., 1960, **13**: 357-9, bibl. 2.

This is mainly a plan for future studies, but contains some preliminary data on the ratio between age and trunk circumference in Cox's Orange Pippin on M.IX.

1976. Fulford, R. M.
The use of defoliating sprays for the control of biennial bearing in apple.
J. hort. Sci., 1960, **35**: 202-13, bibl. 6, illus.

Trees of Laxton's Superb apple treated with 1½% copper sulphate defoliating sprays applied in the "off" year, at a time equivalent to 3 weeks after full bloom, gave more regular cropping than untreated trees for 2 to 3 years without further treatment. Both timing and strength of spray to achieve regular bearing were critical, but even the less successful treatments gave an improvement over the controls. These results are discussed in relation to the growth and development of spur buds. [Author's summary.]—E. Malling Res. Stat., Kent.

1977. Abbott, D. L.
The bourse shoot as a factor in the growth of apple fruits.
Ann. appl. Biol., 1960, **48**: 434-8, illus.

Experiments with cut-back, 2-year-old horizontal cordon apple trees, in which growth of the bourse shoots was regulated, suggest that in the first few weeks after blossoming bourse shoots compete with adjacent fruits, causing some abscission and reduction in fruit growth rate. Later in the season bourse shoots supply carbohydrates to the developing fruits and increase their growth rates.—Long Ashton Res. Stat., Bristol.

1978. Maggs, D. H.
The effect of number of shoots on the quantity and distribution of increment in young apple-trees.
Ann. Bot., Lond., 1960, **24**: 345-55, bibl. 14.

One-year trees of the contrasting rootstock varieties M.XXV, 3426 and 3438 were rigorously selected for size and weight and disbudded in the spring to 1, 2, 3 or *n* shoots per plant, *n* being the number of shoots that grew without disbudding. The treatments were applied in the 1st or 2nd year after planting and the increment during the treatment year was determined by weighing. Provided not more than a few secondary shoots were produced on the current shoots, each additional primary shoot produced an increase in weight. In variety 3438 plants with 1 primary shoot produced many secondaries and these plants were heavier than those with 2 primaries. The largest shoot was not greatly affected in size by the presence of other shoots except in variety 3438 which readily produced secondary shoots. These were most abundant on plants with 1 primary shoot, fewer on plants with 2, and almost negligible on plants with 3 and *n* shoots. Treatment and varietal effects on the percentage distribution of increment as leaves, new stem, old-stem increment and root were small.—E. Malling Res. Stat., Kent.

1979. Barlow, H. W. B., and Hancock, C. R.
The experimental modification of branch form in an apple rootstock.
Bot. Gaz., 1960, **121**: 208-15, bibl. 4, illus.

Lateral buds on stoolbed shoots of the apple rootstock Crab C were induced to grow out into branches, either by decapitating the main shoot at various positions from within the terminal cluster to near the base, or by removing leaves near or within the terminal cluster. The treatments profoundly affected the form of the induced branch system, influencing the number of buds which grew out, the length of the branches, and their angle with the main stem. The average internode length and leaf size on the induced branches were related to the length of the branch; the lengths of successive individual internodes from the base of the branch outward showed a remarkable pattern of fluctuation which was completely independent of climatic variations and almost of treatment. The foliar structures displayed at the base of the induced branch reflected the stage of development of the lateral bud from which it arose: on branches emerging low on the main stem there were 4 to 5 bud scales followed by transitional forms merging into normal leaves; further up the stem the numbers of scales and transitional forms were fewer, until, on those branches growing out from the very young regions, there were no such organs—instead 2 opposite, crescentic leaf-like structures occurred at the extreme base, followed immediately by a normal leaf. Such crescents do not occur on normal shoots of this variety. [Authors' summary.]—E. Malling Res. Stat., Kent.

1980. Loach, A. M.
Factors affecting fibre and vessel member length and the duration of the juvenile period in the wood of the Grenadier apple tree.
Reprint from *J. Oxford Univ. For. Soc.*, 1960, No. 8, pp. 11-17, bibl. 5.

Cell length increased to a maximum in the middle of the growth ring, the increase being much greater in the fibres than in the vessel members. The pattern of fibre length within the ring thus appeared to be mainly governed by intrusive growth. Variation in fibre length outwards from the pith also appeared to be largely due to intrusive growth and to be more closely related to distance, rather than number of rings, from the pith. [Author's summary.]

1981. Ledbetter, M. C.
Anatomical and morphological comparisons of normal and physiologically dwarfed seedlings of *Rhodotypos tetrapetala* and *Prunus persica*.
Contr. Boyce Thompson Inst., 1960, **20**: 437-58, bibl. 54, illus.

The number of cells and their size and shape were determined in 6-week-old seedlings from unchilled seed, chilled seed, and chilled seed treated with maleic hydrazide at 10 p.p.m. for 70 hours before planting to inhibit growth. The first internodes of dwarf seedlings from unchilled seed had fewer cells than normal seedlings from chilled seed, but the volume of individual cells in the epidermis and cortex was very similar. In two series of experiments there were approximately 6 times as many epidermal cells, 4 times as many outer cortical cells, 4·8 times as many inner cortical cells, and 4·2 times as many pith cells in the first internode of the normal plants as in that of the dwarf seedlings. Pith cells were 3·6 times larger than in dwarfed plants. The principal anatomical change during the chilling process to break dormancy of *Prunus persica* was the development of leaf primordia. These primordia probably are directly concerned with regulation of the dormancy responsible for physiological dwarfing. When leaf primordia were removed from *Rhodotypos* seedlings which were developing normally from chilled seed, the internodes failed to continue to elongate. This suggests that the leaf primordia contain some principle which either promotes cell multiplication or else neutralizes an inhibitor of cell development.

1982. Holmsen, T. W.
Pith development in normal and short internode seedlings of *Prunus persica* var. Lovell.
Amer. J. Bot., 1960, **47**: 173-5, bibl. 7, illus.

Short- and long-internode seedlings were externally comparable to short and long shoots, but internally short-internode seedlings corresponded to long shoots with regular cell rows in the pith, whereas irregular groupings were found in long-internode seedlings and short shoots. Sectioning showed that there had been less cell division in the short internodes, but IAA was found to be present in equivalent amounts in both short and long internodes.—Univ. Fla, Gainesville.

1983. Grisdale, S. K., and Towers, G. H. N.
Biosynthesis of arbutin from some phenylpropanoid compounds in *Pyrus communis*.
Nature, 1960, **188**: 1130-1, bibl. 6.

Details are given of chromatographic methods using labelled carbon compounds, which demonstrated the synthesis of arbutin in young pear leaves from shikimic acid and more readily from phenylpropanoid compounds such as phenylalanine, but not from acetate, pyruvate or succinate.—McGill Univ., Montreal.

1984. Krapf, B.
Aussergewöhnliche Bildungen an Kernobst. **(Uncommon growths on pome fruit trees.)**
Schweiz. Z. Obst- u. Weinb., 1961, **70**: 36-8, bibl. 4, illus.

Mostly abnormalities of fruit growth.

1985. Stepanenko, S. D.
Unusual fruit formation on apricot trees. [Russian.]
Priroda, 1960, **49**(7): 94, illus.

Normal fruits grew directly out of 10-year-old branches.

1986. Mukherjee, S. K.
Vivipary in mulberry.
Sci. and Cult., 1960, **26**: 234, illus.

In March 1959 vivipary was observed in 6-year-old plants of *Morus latifolia* form *rotundiloba* imported from France, which had completely shed their leaves the previous winter. Fruits in which seeds germinated were light crimson and non-succulent. Defoliation was found to retard ripening and to promote vivipary.—Cent. sericult. Res. Stat., Berhampore, W. Bengal.

1987. Flood, A. E., Hulme, A. C., and Wooltorton, L. S. C.
The organic acid metabolism of Cox's Orange Pippin apples. I. Some effects of the addition of organic acids to the peel of the fruit.
J. exp. Bot., 1960, **11**: 316-34, bibl. 13, illus.

The basic respirations of Cox's Orange Pippin apples and of the peel tissue prepared from them were compared in fruit in various stages of development, both initially and after storage at 12° C. Both show the same general trend, although as the apples become mature the peak value of the respiration climacteric tends to rise in the whole fruit and to fall in the peel. The effect of adding malate or citrate on the respiration of the same samples of peel was studied. Three broad stages of development were observed. During the first stage (petal fall to 60 days after) the metabolic pattern appears to be different from that during the two later stages. Here O_2 uptake as well as CO_2 output are influenced by the addition of both malate and, to a considerably lesser extent, citrate. In stage 2 (60-125 days from petal fall) the malate effect (CO_2 output) is small until after detachment from the tree, when it rises sharply. In stage 3 (from 125 days after petal fall to full maturity) the malate effect follows the course expected from earlier work, namely, it develops at the same time as the climacteric rise in respiration. The possible reasons for the different behaviour of the peel at the three stages are discussed. Results were similar for Cox's Orange Pippin apples grown on different rootstocks and under different cultural conditions. It is suggested that the malate effect is most active in the epidermal and hypodermal tissues of the fruit. [From authors' abstract.]—E. Malling Res. Stat. and Ditton Lab., Maidstone, Kent.

1988. Catlin, P. B.
Active cytoplasmic particulates from developing apricot fruits.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xiii.

A cell-free system of enzymes was isolated from Tilton apricot fruits from flowering until the fruits were ripe. Enzymes capable of oxidizing pyruvate, citrate, isocitrate, α-ketoglutarate, succinate, fumarate and malate were recorded. The highest activity was obtained when the fruits were growing by both cell division and cell enlargement.—Univ. Calif., Davis.

Pruning and training.

(*See also* 1874, 1898, 1903, 1977, 3592.)

1989. Jonkers, H.
Achtergronden van de vruchtboomsnoei. **(The background of fruit tree pruning.)** [English summary 8 lines.]
Meded. Dir. Tuinb., 1960, **23**: 793-801, bibl. 15, illus.

The author describes briefly historical concepts of pruning and discusses the influence of pruning on tree size, trunk circumference, growth increases in length and thickness of branches, the development of total leaf area and fruit production.—Lab. Tuinbouwpl., Wageningen.

1990. Preston, A. P.
The shaping and pruning of fruit trees.
J. roy. hort. Soc., 1960, **85**: 397-412, bibl. 31, illus.

Tree building including notching and double-heading, tree shapes, pruning methods and experimental comparisons are discussed.—E. Malling Res. Stat., Kent.

1991. Bargioni, G.
Le moderne forme di allevamento in frutticoltura. **(Modern systems of training fruit trees.)**
Inf. Ortofruttic., 1960, **1**: 58-9, illus.

The advantages of the free and semi-free palmette are discussed. These forms are particularly recommended for apple and pear trees, and are showing promise for peach and cherry trees. With peaches, in particular, the rows should run from north to south.

1992. (Falen, E.)
Mechanical pruning in Idaho.
West. Fruit Gr, 1960, **14**(8): 15, illus.

The machine, designed by a grower to prune apple, peach and plum trees, consists of a sickle bar mounted on a tractor, which can be operated from ground level to a height of 20 ft., either vertically or in any position up to an angle of 45°.

1993. Preston, A. P.
Résultats d'essais de taille sur pommiers à East Malling. (**Results of pruning trials on apples at East Malling.**)
Fruit belge, 1960, **28**: 145-52, bibl. 7.

The established spur, renewal and regulated methods of pruning are described. On established spur- and renewal-pruned Cox's Orange Pippin trees flowers on the spurs opened first, followed by those on 3-year, 2-year and 1-year branches in that order; the flowering period was more extended on the renewal-pruned trees. Although the lighter pruned trees did not set such a high proportion of their flowers as the established spur-pruned trees, "June drop" on the latter was more severe. Cox's Orange Pippin on dwarfing (M.IX) and vigorous (M.XVI) stocks flowered equally soon after grafting when both were pruned by the regulated method.—E. Malling Res. Stat., Kent.

1994. Christensen, J. V.
Beskaeringsforsøg med aebletraeer. (**Pruning trials with apple trees.**) [English summary ⅔ p.]
Tidsskr. Planteavl, 1960, **64**: 455-80, bibl. 6.

Four methods of pruning were studied with Cox's, Gravenstein, Ingrid Marie and Jonathan on several Malling stocks. Tree heights were about the same with all pruning methods, but trees which were spur-pruned to 3–5 buds had the smallest crowns. Yields were markedly affected by pruning, and were highest from unpruned, renewal-pruned and Oeschberg-pruned trees. Spur-pruned trees, especially on vigorous stocks, gave relatively low yields. Fruits from trees spur-pruned to 3–5 buds were largest; there were no significant differences in fruit size between unpruned, renewal-pruned and Oeschberg-pruned trees. The colour of Ingrid Marie fruits was best after renewal or Oeschberg pruning, and poorest after spur pruning. The percentage of fruit drops was not affected by the pruning method.—St. Forsøgsstat., Blangstedgaard, Odense.

1995. Viney, R.
Pruning Granny Smith apple trees.
N.Z. J. Agric., 1960, **100**: 479-89, illus.

Granny Smith, particularly when on Northern Spy rootstock, requires a different pruning treatment from other apple varieties to maintain active growth. A satisfactory method of pruning for this variety is described in detail.—Dep. Agric., Auckland.

1996. Hilkenbäumer, F.
Influence de l'arcure sur la croissance et le rendement du pommier et du griottier. (**The effect of arcure on the growth and yield of apple and sour cherry trees.**)
Fruit belge, 1960, **28**: 130-40, illus.

Five-year trials were carried out at Klein-Altendorf (*a*) with apple spindle bushes on M.IX, M.IV, M.XI and seedlings subjected to artificial arcure; with espalier-trained apples with horizontal or oblique branches; and with apple hedges; and (*b*) with morello cherries. The conclusions were that, in comparison with horizontal espaliers, artificial arcure advances and increases bearing in apple and morello cherry, whether on dwarfing or on very vigorous rootstocks. The favourable effect of artificial arcure on early bearing results in yields as early and as large with very vigorous rootstocks as with M.IX. Oblique training of the branches of espalier apples appears to give higher yields than does horizontal training. Fruit hedges give high yields earlier than do strict espaliers. [See also *H.A.*, 30: 1717.]

1997. N.S.W. Department of Agriculture, Division of Horticulture.
Pruning deciduous fruit trees.
Agric. Gaz., N.S.W., 1960, **71**: 178-83, 201, illus.

Notes on the establishment of the vase or inverted hollow cone framework, on summer thinning and on methods of pruning peaches, nectarines, apricots, plums, quinces and persimmons.

1998. Lalatta, F.
Sull'epoca di potatura di produzione del pesco. (**The time for pruning peaches to increase production.**)
Inf. Ortofruttic., 1960, **1**: 90-1.

Early varieties benefit from moderate bud thinning in July immediately after harvesting.

1999. Jacobsen, J. V.
Summer pruning reduces peach bud drop.
J. Agric. S. Aust., 1960, **63**: 542-3.

In some areas a serious bud drop of peaches occurs every year, and appears to be caused by some factor other than *Coryneum* infection (the usual cause of bud drop). Trials showed that the removal of ½-⅔ of the leaf area directly after harvest enabled a good crop to be set the following season. Recommendations for control of *Coryneum beijerinckii* in peaches and apricots include a pink-bud spray of bordeaux mixture (15 : 10 : 100) or copper oxychloride 2½–4 lb./100 gal. and an autumn spray of bordeaux mixture (15 : 10 : 100) + 1 gal. white oil/100 gal. or copper oxychloride 2½–4 lb./100 gal. + 1 gal. white oil.

2000. ŞTEFAN, N., CVASNÎI, D., AND PÎSLARU, C. Cele mai bune sisteme de formare a coroanelor la prun. (**The best pruning treatments for crown formation in plum trees.**) [English, Russian, French and German summaries ½ p. each.]
Grăd. Via Liv., 1960, No. 5, p. 36 + summaries.

Better tree growth and higher yields were obtained with the varieties Tuleu Gras, Anna Späth and Italian Violet when these were trained as tiered or untiered pyramids than when they were left unpruned. Unpruned trees of Tuleu Gras and Anna Späth gave the highest yields during the first 3 years, but after the seventh year they aged prematurely.

2001. ADRIAN, P. A., FRIDLEY, R. B., AND RIZZI, A. D.
Pruning for mechanical harvest.
West. Fruit Gr, 1960, **14**(6): 17-18, illus.

The removal of low branches of prune trees and limiting the trees to 4 primary branches reduced the time required to move the boom shaker from limb to limb from 22·2 to 7·3 sec. and the time required to shake each tree from 100 to 21·3 sec. Movement of the catcher frame from tree to tree was also reduced from 41·3 to 29·4 sec. Too much pruning should be avoided, however, to ensure that the reduction in yield is not excessive. Young prune trees should be trained with 3 scaffold limbs for mechanical harvesting.—Univ. Calif., Davis.

2002. BALDINI, E.
Il razionale trattamento delle ferite da potatura agli alberi da frutto. (**The correct treatment of pruning wounds on fruit trees.**)
Inf. Ortofruttic., 1960, **1**: 9-12, illus.

The preparations recommended for coating pruning wounds are Proxyl Maag [composition not stated] and a mixture of bitumen, asbestos and creosote. Lead or zinc paints are generally suitable but may retard callus formation. Carbolineum and ferrous sulphate are both unsatisfactory, especially for peach trees.

Pollination and fruit set.

(*See also* 2308.)

2003. LÖTTER, J. DE V.
Recent developments in the pollination technique of deciduous fruit trees.
Dec. Fruit Gr, 1960, **10**: 182-91, 212-24 and 304-11, bibl. 55, illus.

A review of the literature and of the author's own work on the following aspects: pollination by bees; pollination by artificial means, including methods of hand pollination, spraying pollen suspended in water, spraying with pollen fed into the airstream of a blower-type sprayer, the use of pollen-loaded cartridges and bombs, and pollination by means of aeroplanes; collection and storage of pollen; pollen germination tests; pollen mixtures.

2004. PLUMIER, W.
Nombre chromosomique et valeur du pollen chez les arbres fruitiers. (**Chromosome number and pollen value in fruit trees.**)
Rev. Agric., Brux., 1960, **13**: 341-3.

Studies with apples, pears and plums indicate that pollen percentage germination is high (60% and over) amongst diploid varieties and highest (80% and over) amongst varieties which have very regular meioses. The pollen of triploid varieties had a low percentage germination but it was sufficient to ensure a commercially satisfactory fruit set.—Stat. Amél. Plantes fruit., Grand-Manil, Gembloux.

2005. TUPÝ, J.
Sugar absorption, callose formation and the growth rate of pollen tubes. [Czech and Russian summaries ½ p. each.]
Biol. Plant., Prague, 1960, **2**: 169-80, bibl. 28.

Apple pollen tubes grown in 10% sucrose solution at 25° C. inverted the greater part of the sucrose. When the sucrose concentration of the solution fell to 5%, the growth rate of the tubes decreased. Reduction in growth rate and increase in callose accumulation was probably accompanied by a drop in the respiration of the glucopyranose component of the absorbed sucrose. Boron stimulated pollen tube growth.—Czech. Acad. Sci., Prague.

2006. KONSTANTINOV, A. V.
The embryology of certain apple varieties. [Russian, with English summary ⅓ p.]
Izv. Akad. Nauk SSSR, Ser. biol., 1960, No. 2, pp. 256-64, bibl. 12, illus.

The biology of flowering and fertilization was studied in 10 diploid apple varieties grown both in the Leningrad region and in the North Caucasus. Anomalies in the development of the ovules and embryo sacs, causing derangements in fertilization and reduced seed and fruit production, occurred more frequently in the north, especially in early flowering varieties.

2007. YAKOVLEV, A. S.
Pollination of orchards by bees increases the productivity of the work of horticulturists. [Russian.]
Pchelovodstvo, 1959, 36(5): 22-5, from abstr. in *Bee World*, 1960, **41**: 251.

Apple yields were 50·7 centners/ha. when bee colonies were placed 0·3 km. from the orchard, but when apiaries were 1·5-1·9 km. from the orchard yields were only 23·5 centners/ha. The financial return per man-day unit of work was increased by 63·6% by placing the apiary at the site nearer to the orchard.—Beekeep. Res. Inst., Rybnoe, Ryazan Prov.

2008. Phillips, W. R., and Poapst, P. A.
The influence of pollination on storage behaviour.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, pp. 7-8.

Apples from McIntosh trees pollinated by open pollination and by pollen from Antonovka, Crimson Beauty and Cortland showed core flush indices of 110, 50, 30 and 20 respectively during storage at 35° F.—Cent. exp. Fm, Ottawa.

2009. Abramov, N. A.
Effect of partial pollination on the development of fruit and seeds in apple and pear. [Russian.]
Trud. plodoovoshch. Inst. Mich., 1956, **9**: 101-9, from abstr. in *Bee World*, 1960, **41**: 241.

Fruit size of 4 apple varieties increased as fewer styles per flower were pollinated. The largest fruits of Pepin-Shafrannyi apple and a pear followed pollination of 1 or 2 styles. Quality of the developing seeds after partial pollination was best with varieties possessing closed seed cavities. With ordinary fertilization the lightest seeds were found in fruits containing more or less than the average number of seeds.

2010. Breviglieri, N.
Impollinazione e consociazione. (**Pollination and mixed planting.**)
Inf. Ortofruttic., 1960, **1**: 18-19, illus.

Recommendations for selecting and planting suitable pollinator varieties in apple and pear orchards.

2011. Breviglieri, N.
Varietà impollinatrici del pero. (**Pollinator varieties for pears.**)
Inf. Ortofruttic., 1960, **1**: 84-6, illus.

The 28 principal pear varieties grown in Italy are listed, each with the appropriate pollinators.

2012. Davison, R. M.
Fruit-setting of apples using gibberellic acid.
Nature, 1960, **188**: 681-2, bibl. 5.

GA, applied as a 1% lanolin paste to the receptacles during flowering, induced parthenocarpic fruit development on Sturmer, Cox's, Strawberry Norman and Red Jersey apples. The technique is described; a 400 p.p.m. spray was also effective and the addition of 2,4-D or kinetin did not enhance the effect of the GA. There was a heavy drop 5–7 weeks after treatment. The parthenocarpic fruit was normal in colour, time of ripening and quality but smaller in size than normal fruit and somewhat misshapen.—D.S.I.R., Auckland, N.Z.

2013. Larsen, F. E., Johnston, S., and Moulton, J. E.
Fruit set of emasculated and hand-pollinated peach and apricot blossoms in different microenvironments.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 43-57, bibl. 5, illus.

Clear polythene, waxed white parchment and unwaxed white parchment bags were tested for increasing fruit set; apricots in waxed and peaches in unwaxed bags produced significant increases over the controls.

Fruit thinning and development.

(*See also* 3595.)

2014. Hebert, S.
Chemical thinning of apples.
A.R. pomol. Fruit Growing Soc. Que., 1959, pp. 88-90.

Hormones, used for thinning, influence the size, colour and quality of the fruit, regulate the bearing habit of the trees and also maintain their vigour. They are particularly useful with biennial varieties such as Yellow Transparent, Melba, Early McIntosh, Fameuse, Wealthy and Delicious. Amid-Thin applied at full-bloom or petal-fall is suitable for early varieties, whereas NAA applied 7–10 days after bloom is suitable for semi-early or late varieties. The addition of Tween-20 does not increase the immediate effect of the hormones but improves the bloom in the following year.

2015. Titus, J. S.
The synergistic effect of a wetting agent on NAA used in fruit thinning.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 54-7, bibl. 1.

NAA at 7 p.p.m. plus Tween-20 ($\frac{3}{4}$ pt./100 gal.) was as effective as NAA alone at 20 p.p.m. in thinning Golden Delicious and Rome Beauty apples when applied 18 and 14 days after full bloom, respectively. Both formulations were ineffective in thinning Jonathan and Delicious in this experiment.

2016. Johnson, R. A.
Growth regulator studies on apples.
Me Fm Res., 1960, 8(2): 24-6.

Results of fruit thinning trials on McIntosh and a number of other varieties, using sprays of NAA and naphthaleneacetamide (NAAmide), were inconsistent from year to year, but showed that NAAmide should be used close to petal fall and NAA about 7–12 days after petal fall. The addition of Tween-20 gave a greater and more consistent thinning effect. Trichlorophenoxypropionic acid at 20 p.p.m. gave good control of pre-harvest drop, but it was even more effective at 10 p.p.m. combined with Tween-20, although in both cases the storage life of the treated apples was shortened. NAA was not so effective but could be applied closer to the date on which pre-harvest drop was expected to start.

2017. Mullett, R. A.
Helping the horticulturist with hormones.
J. Agric. Vict., 1960, **58**: 293-5.

Recommendations on the use of NAA and 2,4,5-TP for control of pre-harvest drop of apples and NAA for blossom thinning.

2018. Denne, M. P.
The growth of apple fruitlets, and the effect of early thinning on fruit development.
Ann. Bot., Lond., 1960, **24**: 397-406, bibl. 13.

The development of fruitlets of the varieties Cox's Orange Pippin and Miller's Seedling was investigated with particular reference to the rate and duration of cortical cell division and expansion. The fruitlet weight increased slowly for the first few days following pollination, then exponentially at a rapid rate for about 3 weeks, and then at a declining rate until harvest. The rate of cell division was very rapid during the exponential phase of fruitlet growth, subsequently declining, but division continued until about 12 weeks after full bloom in Miller's Seedling and for at least 6 or 7 weeks after pollination in Cox's Orange Pippin. The cells expanded exponentially until about 7 weeks after pollination, and then continued to expand at a diminishing rate until harvest. Heavy pre-blossom thinning increased the fruit size and weight, affecting the rate of both cell division and cell expansion; the differences in fruit weight were evident by the 4th week, and in cortical cell number and cell diameter by the 5th week, after full bloom. [From author's abstract.]—E. Malling Res. Stat., Kent.

2019. Cripps, J.
Hormone sprays for apricots.
J. Agric. W. Aust., 1960, **1**: 525-6.

The tri-ethanolamine salt of 2,4,5-TA increased fruit diameter by 5–15% as a result of an increase in size but not number of cells.

Fruit quality and composition.

(*See also* 2028, 2309, 3566.)

2020. Lott, R. V.
What is this thing called apple quality? Part 1. Standardizing the intangible "it". We *can* supply consumers with apples of quality. Part 2. How to achieve the intangible "it".
Amer. Fruit Gr, 1960, **80**(9): 10-11, 21, illus., and **80**(10): 8-9, 17, 21, 23, illus.

Part 1 is an examination of the concept of quality, including maturation, ripeness, sugar and acid contents and colour. In part 2 the author discusses the feasibility of quality standards using the correlation between quality and skin and flesh colours. Some production and handling practices are discussed in relation to quality.—Univ. Ill., Urbana.

2021. Kirkpatrick, M. E., and others.
Quality of apples for household use.
Home Econ. Res. Rep. U.S.D.A. **8**, 1959, pp. 79, bibl. 54, illus.

Data are tabulated on the histological structure, chemical composition, palatability and cooking quality, before and after storage, of Delicious, Golden Delicious, Jonathan, Rome Beauty, Stayman and Winesap. [See also *H.A.*, 30: 4934.]

2022. O'Grady, L. J.
The N/K ratio in McIntosh leaves *vs.* yield, color and storage of fruit.
Summary in *A.R. pomol. Fruit Growing Soc. Que., 1959*, p. 79.

The best yield and fruit colour were obtained from trees with a leaf N content of 2·0–2·5% and a leaf K content of 1·5% or over. A total N content of more than 2·5% resulted in poor fruit colour and at under 2·0% N total yields, fruit size and annual growth were adversely affected. After storage at 35° F. the quality of the fruit was excellent, regardless of the leaf levels of N and K.

2023. Bünemann, O.
Über Beziehungen zwischen Qualität und Haltbarkeit von Äpfeln in Abhängigkeit vom Mineralstoffgehalt des Bodens und der Blätter. II. Beziehungen zwischen dem Nährstoffspiegel im Blatt und der Lagerqualität bei drei Apfelsorten. **(The relationship between the harvest quality and the keeping quality of apples in relation to the mineral content of the soil and the leaves. II. The relationship between the nutrient level of the leaf and the keeping quality in three apple varieties.)** [English and French summaries ½ p. each.]
Gartenbauwiss., 1959, **24**: 457-71, bibl. 30.

The following correlations were found: (1) The N content of the leaves was positively correlated with the fruit size; there was a negative correlation with flesh firmness, flavour and, in some cases, with the sugar content and blush colour. (2) No correlations were found between leaf P content and fruit quality. (3) Leaf K was positively correlated with acidity, flesh firmness and good keeping quality in general (susceptibility to rots, physiological disorders, etc.). (4) The correlations of leaf Mg were inverse to those of leaf K, but a positive correlation existed between Mg levels and colouring factors. (5) Leaf Ca was positively correlated with individual fruit weight and with fruit colour, but negatively with flesh firmness. The numerous varietal differences were accounted for by specifically low or high contents of certain nutrient elements, especially K and Ca. From the data presented no ranges of mineral leaf contents could be deduced which would be conducive to optimum fruit quality and storage life. [Author's summary.—For part I see *H.A.*, 30: 3386.]—Inst. Obstb. Baumsch. tech. Hochsch. Hannover.

2024. BÜNEMANN, O.
Über Beziehungen zwischen Qualität und Haltbarkeit von Äpfeln in Abhängigkeit vom Mineralstoffgehalt des Bodens und der Blätter. III. Beziehungen zwischen den Ergebnissen von Bodenuntersuchungen, Blattanalysen und Fruchtmerkmalen bei drei Apfelsorten. (**The relationship between the harvest quality and the keeping quality of apples in relation to the mineral content of the soil and the leaves. III. The relationship between the results of soil analyses, leaf analyses and fruit characters in three apple varieties.** [English and French summaries ½ p. and ¾ p. respectively.]
Gartenbauwiss., 1960, **25**: 53-66, bibl. 37.

Significant correlations were found between the soil K and Mg contents and their levels in the leaves, as well as an influence of the K/Mg ratio on the respective leaf nutrient contents. The influence of the subsoil contents of these elements was particularly great. An increase in the soil pH value increased the Ca and Mg contents of the leaves. The correlations between soil and fruit characteristics confirmed the corresponding correlations between leaves and fruits described in part II [see preceding abstract]. In particular, there were positive correlations between K and fruit acidity, and between Mg and the prevention of weight losses, shrivelling and physiological disorders. The pH value was correlated positively with the dry matter content and blush intensity. There was a negative correlation between the pH value of the soil and the firmness of the fruit. The evaluation of correlation coefficients in survey work is discussed, and possible sources of error as well as of varietal differences are mentioned. [From author's summary.]—Inst. Obstb. Baumsch. tech. Hochsch. Hannover.

2025. MOCHIZUKI, T., AND HANADA, S.
Effect of soil moisture on the growth and quality of apple fruits. Part 1. Fruit growth and quality in an orchard with a low soil moisture content. [Japanese, with English summary ½ p.]
Bull. Fac. Agric. Hirosaki Univ., 1960, No. 6, pp. 43-56, bibl. 20.

The keeping quality of Jonathan apples grown in a relatively dry soil was greater than that of apples grown in a wet soil, since the cell size was decreased and the cell wall development increased. The N supply to the fruit was lower in the dry soil, and this reduced the rate of post-climacteric respiration.

2026. HARRIS, N., AND KENWORTHY, A. L.
Acceptance of apples by a taste panel as related to chemical composition.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 149-53, bibl. 6.

Golden Delicious apples held in cold storage at 32° F. for one month after harvest were placed in respiration chambers at 75° F. for 0, 3 and 6 days. Evaluation by a taste panel appeared to be positively related to total pectin and acid-soluble pectin contents, and inversely related to contents of reducing sugars and total sugars.

Harvesting, packing and marketing.

(*See also* 1791-1793, 1877, 2001, 2063, 3576.)

2027. EGGERT, F. P.
Harvesting and storage of apples.
Me Fm Res., 1960, **8**(2): 32-3.

From 1951 to 1959 fruit from McIntosh trees was harvested at various intervals and stored at 32° F. to determine which dates resulted in the best keeping fruits. Petal-fall dates and growing season temperatures were also noted. From these data a date was predicted for optimum harvest in 1959 which proved accurate to within 1 day. Studies on the rate of cooling during storage showed that adequate space should be left over the top of the stacks of containers and also by the 2 end walls behind and opposite the blower.

2028. LASNIER, G. G.
When to pick apples and what factors influence their maturity and quality.
A.R. pomol. Fruit Growing Soc. Que., 1959, pp. 71-6, bibl. 10.

A short review.

2029. AMERICAN FRUIT GROWER.
Power in the orchard.
Amer. Fruit Gr, 1961, **81**(1): 11-24, 28-32, 35-6, illus.

In this issue there are 5 articles on mechanization in American temperate orchards, concerned mainly with growers' experiences with mechanical harvesting and bulk handling.

2030. MCBIRNEY, S. W.
Reducing costs of harvest labor.
West. Fruit Gr, 1960, **14**(6): 23-4, illus.

Apple harvesting equipment under development includes a self-propelled machine carrying the fruit picker and a bulk bin, with an adjustable height platform. The apples may be dropped by the picker into a canvas funnel which leads through a baffled, canvas tube to the bin. Trials have shown that the pickers' output could be doubled by use of this equipment.—U.S.D.A., Wenatchee, Wash.

2031. Anon.
Bins are in at Gerber.
West. Fruit Gr, 1960, **14**(6): 29-30, illus.

Tests by Gerber Products Co., Calif., showed that pallet bins, 47 × 47 × 30 in., store 20–35% more fruit than lugs, per sq. ft. of area, at half the cost. They are used for apples, pears, peaches and vegetables.

2032. Heebink, T. B.
Rugged tests for bins.
West. Fruit Gr, 1960, **14**(8): 13-14, illus.

Various types of apple pallet bin, all 47 × 47 × 29 in., were sprayed with water for 8 hours followed by 2 days at 130° F.; 6 rough-handling tests were then applied. The construction of each type and its performance in the tests are described. Two stood up to the rough treatment particularly well. One had vertical side boards of Douglas fir, attached top and bottom to horizontal 1 × 6 in. members. This bin had triangular corner posts, 3 × 4 in. outer stringers, and 1 × 6 in. bottom deck boards. Each side was fastened to the corner posts with three large spiral-grooved nails at the top and bottom. The other satisfactory bin was the only one fastened with wire ties at the corners and metal U-clips at the base. It had ⅜ in. vertical hardwood side boards, three horizontal exterior cleats, 3 × 4 in. stringers, and no bottom deck boards. The pallet base had restraining cleats around the top perimeter to hold the sides in against the fruit. —Forest Products Lab., Madison, Wis.

2033. Vačejšvili, S. Ja., and Kikabidze, I. S.
Implements and equipment for apple harvesting. [Russian.]
Sadovodstvo, 1960, No. 8, pp. 18-20, illus.

Including 2·4 × 1 × 0·5 m. bins of 700–800 kg. capacity handled by fork lifts.

2034. Stewart, N.
Bin handling of apples and pears. Handling bins at the packhouse.
Comm. Gr, 1960, No. 3391, pp. 1372-4, illus.; and 1961, No. 3394, pp. 133–5.

Bulk handling has been used at the Kent Farm Institute since 1952, and the author gives advice to growers on bin construction, picking into bins, transport to the packing house and packhouse design for bin storage.

2035. Buss, W. T.
Bulk bins reduce storage costs.
Grower, 1960, **54** (Fruit supplement): 2-5, illus.

Less time is used in filling a store, and 40% more fruit can be stored using bulk bins instead of conventional boxes. End-gate discharge of fruit from the bins has proved to be the least expensive method of discharge. Discharge by the water flotation method is also described.

2036. Pflug, I. J., and Dewey, D. H.
Unloading soft-fleshed fruit from bulk boxes.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 132-41, bibl. 5, illus.

A water flotation and transfer machine is described. The pneumatically operated carriage lowers the bulk bin into a tank and the apples float clear and are transferred by a current of water on to a conveyer. They are then rinsed and dried. Specifications of the different components are noted. Bruising studies on McIntosh and Golden Delicious showed that the percentage of serious bruising was relatively small and only a fraction of that which occurs with a tilting-type bulk box dumper.

2037. Burt, S. W.
An improved station for packing apples.
Agric. Mktg, 1960, **5**(7): 10, illus.

Packer productivity can be increased 10% by using tilted working surfaces, locating the apple supplies directly over the cartons, having a chute for culls, and packing the most common grades at the front of the bench.—Me agric. Exp. Stat.

2038. Perkins, F. A., and Underwood, J. W.
Improved consumer packages for Maine McIntosh apples.
Bull. Me agric. Exp. Stat. **591**, 1960, pp. 20, bibl. 3, illus.

Packages investigated included the cell-insert package, moulded pulpboard trays and polythene bags. Shipping damage, material and labour requirements for each type of package were studied. The amount of damage normally sustained by jumble-packed apples in polythene bags was reduced by over 50% by using the other 2 types of packaging, and the increased cost was only 1 cent per lb. of fruit.

2039. Joubert, J. A.
A more economical system for harvesting Bon Chrétien pears.
Dec. Fruit Gr, 1960, **10**: 177-9, illus.

The higher cost of picking-over 2 or 3 times may be more than justified by increased fruit weight if a minimum of 5–7 days is allowed to elapse between pickings. Fruits of 2⅜ in. diameter increase by 259 lb./ton after 6 days and fruits of 2⅛ in. diameter increase by 726 lb./ton after 12 days.—W.P. Fruit Res. Stat., Stellenbosch.

2040. Anon.
Peach knocking—where we stand.
West. Fruit Gr, 1960, **14**(10): 13-14, illus.

Trials in Californian peach orchards have shown that it is possible to harvest 20–30 trees an hour by using units made up of 2 guns, mounted at opposite ends of a catching frame, each consisting of a long hollow tube with a rubber-padded knocking head which is actuated by shooting a 5 lb. weight up the barrel. The fruit which falls onto the frame is conveyed to the rear of the machine into lug boxes. An inertia shaker mounted on a catching frame is also described.

2041. Anon.
Bulk handling of clings.
West. Fruit Gr, 1960, **14**(6): 19-22, illus.

Large volume peach graders and portable graders for use in the field are discussed. Fruit for one large volume grader was taken from the orchard in steel gondolas, each holding 6,000–6,500 lb. of fruit, to the grading station where it was washed into a receiving pit, carried on an elevator to a sizing screen and on to the grading table. The No. 1 fruit was rolled into a wooden bin submerged in a water-filled pit. When full, the bin was passed through a hydrocooling tunnel where the fruit was continually drenched with water at 40° F. before being sent to the cannery. The use of a bin sampling device is described.

2042. Elam, F. L.
Custom cling grader.
West. Fruit Gr, 1960, **14**(7): 26, illus.

Peaches are delivered from a bulk trailer onto a grading machine where they are picked up by sizing cups, the small fruit passing through the sizing cups onto a conveyor belt which takes it to the pickle boxes. Fruit for canning is hand sorted for quality in the sizing cups. The grading machine has a capacity of at least 20 tons an hour and 15–20 min. is required to empty a trailer.

2043. Farris, D. E., Kattan, A. A., and Rom, R. C.
Tree-ripe peaches can increase profits.
Arkans. Fm Res., 1960, **9**(3): 8, illus.

Packaged "firm-ripe" peaches averaged 50% greater sales than "firm" peaches and 100% greater sales than "hard" peaches. Firm-ripe fruit sold better in window-box containers than in plastic trays.

2044. Anon.
Machine-harvested plums.
Amer. Fruit Gr, 1960, **80**(11): 22.

Harvesting of Stanley plums with a machine developed for cherry harvesting was successfully tried by the Michigan State University and the U.S. Department of Agriculture over 2 seasons. The machine consists of a tractor-mounted, hydraulically-operated boom shaker; the claw is attached to a scaffold limb and the plums are shaken off into canvas-covered metal collecting units. Depending on the degree of fruit maturity and the shape of the tree, from 93 to 99% of the fruit was gathered. A 5-man crew could harvest about 51 bushels per hour. Quality was comparable to that of hand-picked fruit for processing.

2045. Adrian, P. A., and Fridley, R. B.
Catching frame cuts labor costs.
West. Fruit Gr, 1960, **14**(6): 18, bibl. 1, illus.

Prune harvesting labour costs using a low-profile catching frame were only half those of hand picking. —Univ. Calif., Davis.

2046. Fridley, R. B., Adrian, P. A., and Miller, M. W.
Dry bulk handling of prunes.
West. Fruit Gr, 1960, **14**(7): 19.

In trials to find the most satisfactory depth of bulk-bin for French prunes, the ratio of damaged fruit at the bottom of the bin to damaged fruit at the top was measured, in bins 47 × 47 in. across filled to various depths. No significant difference was noted between 14- and 27-in. depths, unless the fruit was allowed to stand in the bin for more than 24 hours, when the depth should not exceed 16 in. Tests showed that fruit damage occurred mainly during harvesting and bin filling, not during bulk handling. The bottom of the bin should be solid or have closely spaced boards to prevent fruit damage.—Univ. Calif., Davis.

2047. Stallings, D. G.
Ways to reduce plum packing costs.
Agric. Mktg, 1960, **5**(8): 14-15, illus.

By the use of cartons instead of crates, bulk filling instead of place packing, increasing the size of the packing plant and increasing the hours of operation per season. [See also *H.A.*, 30: 272.]

Storage.

(*See also* 1794, 1796, 2008, 2021-2027, 2104, 3565, 3566, 3576, 3591, 3602.)

2048. Fidler, J. C., and Mann, G.
The construction of cold stores for fresh fruit and vegetables. 1. Biological aspects. 2. Building and engineering requirements.
Reprinted from *Symp. Inst. Refrig., 1960*, pp. 20, bibl. 7, illus., as *Mem. Ditton Lab.* **10**.

A fruit store should be capable of rapid reduction in temperature; for example, the temperature for apples should be 38° F. within 2 days of completion of loading, and 30° F. in air or 34° F. in gas for pears. It should take only 4 days to fill a gas store and 6 to fill an ordinary cold store. Current recommendations for storage of apples and pears are given. Insulation, fans, air distribution, store air coolers, refrigerating units and control of the concentrations of CO_2 and O_2 are also discussed.

2049. Padfield, C. S.
Controlled atmosphere storage of apples.
Fruit and Prod., August 1960, pp. 2, 5.

Method, costs, construction of stores, advantages and disadvantages discussed.

2050. Noordzij, P.
De invloed van het type gascel op de kwaliteit van het bewaarde fruit. **(The effect of the type of gas store on the quality of the stored fruit.)**
Fruitteelt, 1960, **50**: 1265-7, illus.

Fruit quality of both apples and pears was slightly better after storage in a Dutch type of refrigerated gas store than in an English type.—I.B.V.T., Wageningen.

2051. Mann, G.
The use of ethanolamine in scrubbers for fruit stores.
Reprinted from *Mod. Refrig.*, October 1958, pp. 4, bibl. 5, illus., as *Misc. Pap. D.S.I.R. Food Invest.* **28/58**.

Mono- and tri-ethanolamine have proved to be the most efficient absorbents of CO_2 from gas stores. Two possible arrangements of scrubber units are described in which mono-ethanolamine may be regenerated after use by heating it to about 230° F. for 1 hour.—Ditton Lab., Maidstone, Kent.

2052. Tomkins, R. G.
The conditions for the gas storage of certain fruits and vegetables obtained by the use of a simple small-scale method.
Reprinted from *Proc. 10th int. Congr. Refrig., Copenhagen, 1959*, pp. 4, bib. 7, as *Mem. Ditton Lab.* **4**.

Storage trials were carried out in containers (10–80 l. capacity) with lids of thin aluminium sheet, ventilated with holes at the top and bottom through which rubber tubing of different sizes was inserted for the circulation of air to and from a katharometer. The best storage condition for Cox's Orange Pippin apples was shown to be a temperature of 38° F. in 6% CO_2. Optimum storage of Merton Worcester, Egremont Russet, Michaelmas Red, Ingrid Marie, Howgate Wonder and Sunset required a CO_2 concentration of 6–8%. Packham pears were successfully stored at 35° F. in 6–7% CO_2, peas in the pod in 6% CO_2 and root vegetables in 6–8% CO_2 which suppressed sprouting and root formation. Storage life of brussels sprouts and leeks was prolonged over a range of temperatures in 15–16% CO_2.

2053. Eaves, C. A.
Jacketed plastic C.A. storage for apples.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 1.

Apples were stored successfully for 7 months in a compartment made by stretching a plastic sheet, 1 mil thick, over wooden frames inside a cold store. A temperature of 38° F. was maintained without additional heat after being obtained initially by warming the air. The atmosphere was maintained at 5% CO_2 and 3% O_2 by means of a dry scrubber.—Kentville Res. Stat., N.S.

2054. Leblond, C.
Conservation des fruits en atmosphère contrôlée dans des enceintes limitées par des films de matière plastique. **(Fruit storage in a controlled atmosphere inside plastic films.)** [English, German, Russian and Spanish summaries $\frac{1}{4}$ p. each.]
Fruits d'Outre Mer, 1960, **15**: 307-16, bibl. 9, illus.

Reviewing previous work on the subject, the author stipulates that an atmosphere of 2% O_2 and 5–10% CO_2 must be maintained within the pack by differential permeability of the plastic film. He records successful semi-industrial trials with Williams' pears and Golden Delicious apples at normal temperatures, and preliminary trials with Starking and Richared apples.—Lab. Biol. veg., C.N.R.S., Bellevue.

2055. Spina, P., and Damigella, P.
Prove sulla conservazione della frutta. **(Experiments on fruit storage.)**
Tecn. agric., 1960, **12**: 392-405, bibl. 19, illus.

Pears and oranges in ordinary and refrigerated storage lost less weight and maintained their quality longer when packed in polythene bags. In cold storage hermetically sealed bags were best for both fruits, but in non-refrigerated storage the pears kept better in well ventilated than in sealed bags. The use of the bags was justified economically.—Ist. Colt. arbor., Univ., Catania.

2056. Marcellin, M.
La conservation des fruits à des températures voisines de la température ordinaire au moyen d'emballages de matière plastique. **(Fruit preservation at near ordinary temperatures by means of plastic wraps.)**
Ind. Plastiques mod., 1960, No. 3, reprinted in *Bull. hort., Liège*, 1960, **15**: 279-87, illus.

Plastic wraps of either polythene or ethylcellulose, 0·05 mm. thick, were found to triple the storage life of apples and, in particular, Williams' pears at ordinary cellar temperatures.—Lab. Biol. Froid, C.N.R.S., Bellevue.

2057. Tomkins, R. G.
The problems in gas storage to-day.
Grower, 1960, **54** (Fruit supplement): 6-8.

Aspects requiring further investigation.

2058. Rasmussen, P. M.
Aeblelagring. **(Apple storage.)**
Erhvervsfrugtavl., 1960, **27**: 10-12, illus.

Including a table of the behaviour of 16 varieties in ordinary, cold and gas storage.

2059. Nyhlén, Å., and Nilson, T.
Kolsyrelagring av äpple 1954-1957. **(Gas storage of apples, 1954-1957.)** [English summary 2 pp.]
K. Skogs- LantbrAkad. Tidskr., 1960, **99**: 171-211, bibl. 3.

Fruits of 4 apple varieties were harvested on 2 or 3 dates in 3 seasons, and were stored in large (500 kg.) and small (120 kg.) boxes in an ordinary cold store (4° C.) or in a refrigerated gas store. Appearance of fruit from the gas store was superior to that of fruit from the ordinary cold store. There seemed to be no difference in wastage when the varieties were stored separately or when 2 were stored together. Cox's in the gas store kept until mid-January without showing brown heart. Both Ingrid Marie and Ribston showed brown heart when stored until mid-February, while Ribston stored until mid-March was severely affected. Brown heart developed quickly at room temperature after removal from the store. The incidence of brown heart was greater in large than in small boxes, a result of the higher temperature. Larger apples were also more susceptible to brown heart than smaller apples. Bitter pit was more common in ordinary cold storage than in gas storage, and was increased by delayed storage (Ribston), by later harvesting (Cox's), and in larger boxes. Low temperature breakdown and scald were less frequent in gas storage than in ordinary cold storage, although there was little scald in either store. Storage scab generally occurred about equally in both types of store, although Ingrid Marie fruits in cold storage showed more disease; the disease was more common in large than in small boxes. *Gloeosporium* infections found more favourable conditions for development in the cold store; box size was not related to fruit infection, but damage was severe among fruits stored in polythene bags. The incidence of grey and blue moulds was less following gas storage. It is concluded that conditions in a gas store are preferable to those in an ordinary cold store, owing to the slower rate of ripening which results in fewer storage defects.—St. Trädgårdsförs., Alnarp.

2060. Porritt, S.
Controlled atmosphere storage.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, pp. 2-3.

Spartan and Newtown apples were stored at 34° F. in atmospheres containing 5% CO_2 + 3% O_2 and 7% CO_2 + 14% O_2. In both varieties the low oxygen atmosphere gave the better results. Gas storage maintained the firmness of the Newtowns but hastened the softening of the Spartans. In a commercial trial with McIntosh at 35° F. scald and CO_2 injury were pronounced with the 7% CO_2 + 14% O_2 atmosphere, although the scald could be completely prevented by a dip of 1,000 p.p.m. diphenylamine.—Summerland Res. Stat., B.C.

2061. Porritt, S.
Use of diphenylamine in scald control.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 3.

The incidence of scald in immature Delicious and Stayman apples was reduced from 55 and 75% to 19 and 15% respectively by oil wraps, and became negligible with a dip of 1,000 p.p.m. diphenylamine plus 0·075% Triton X100 as a wetting agent. DPA with Tween-20 or Colloidal spray modifier was less effective.—Summerland Res. Stat., B.C.

2062. Fidler, J. C.
The control of superficial scald of apples.
Reprinted from *Proc. 10th int. Congr. Refrig., Copenhagen, 1959*, pp. 5, bibl. 29, as *Mem. Ditton Lab.* **5**.

Control measures include later picking dates, reduction of delay between picking and storage, adjustment of atmospheric composition or temperature during storage, and the application of diphenylamine (DPA) to the fruit by means of impregnated paper wraps, tree spraying, flood spraying of fruit passing over rollers, mechanical dipping, steam distillation or spraying liquid on loosely packed boxes of fruit.

2063. Stevenson, C. D.
Effect of maturity and tree age on the behaviour of Queensland grown Delicious apples stored at 34–36° F.
Qd J. agric. Sci., 1959, **16**: 291-7, bibl. 4.

The main storage disorder encountered over a period of 4 years was superficial scald, which was extremely severe in fruit picked in February. Later picking dates resulted in almost complete absence of the disorder. As a general rule, fruit from young trees was more susceptible to storage disorders than that from old trees. Of the picking dates studied, those in the first week in March resulted in long storage with fewer disorders than the earlier picking dates. In order to avoid severe losses due to withering in the store, the fruit should be removed from storage before the end of September. [From author's summary.]

2064. Truscott, J. H. L.
An induced "scald" in McIntosh apple.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, pp. 4-5.

McIntosh apples developed symptoms of deep scald when exposed before storage to temperatures above 110° F. for periods varying with the temperature. Similar symptoms were obtained by exposure to infra-red heat at distances of from 8 to 18 in. The symptoms were delayed or prevented by rapid air movement over the fruit.—Vineland Stat., Ont.

2065. Poapst, P. A., and Phillips, W. R.
Delayed controlled atmosphere storage.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 3.

Apples stored for 2½ months at 30° F. and then transferred to an atmosphere of 5% CO_2 and 16% O_2 at 38° F. were compared with those left at 30° F. for the whole 7 months. The delayed gas storage improved quality and reduced fungal wastage to a half, core flush to a third, and low temperature breakdown to a twenty-second.—Centr. exp. Fm, Ottawa.

2066. Poapst, P. A., Durkee, A. B., and Phillips, W. R.
Growth regulating activity and core flush in McIntosh apples.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 7.

Extracts of core tissue from apples stored at 50° F. showed a steady root initiation effect on beans, whereas those from apples stored at 32° F. showed a declining activity which disappeared after the fruit had been stored for 5½ months and core flush had developed.—Centr. exp. Fm, Ottawa.

2067. N.S.W. Department of Agriculture, Biological Branch.
Bitter pit in apples.
Agric. Gaz. N.S.W., 1960, **71**: 369-72, illus.

Including notes on varietal susceptibility, types of pit and control measures.

2068. Titus, J. S.
Bitter pit of apple.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 64-7, bibl. 4.

Symptoms, varietal susceptibility, orchard practices affecting the disorder and recommendations to minimize it.

2069. Buchloh, G.
Entstehung und Verhinderung der Stippigkeit bei Äpfeln. (**The causes and prevention of bitter pit in apples.**)
ErwObstb., 1960, **2**: 227-9, bibl. 16, illus.

In dipping and fruit spraying trials with solutions of Ca salts, 1% Ca acetate and 1% Ca nitrate reduced bitter pit incidence from 71% in the controls to 41% and 6%, respectively. The roles of organic acids and boron in the induction of bitter pit are discussed.—Inst. Obstb., Univ. Bonn.

2070. Phillips, W. R., Poapst, P. A., and MacQueen, K. W.
Irradiation of apples for fruit storage.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, pp. 8-9.

Exposure of McIntosh apples to 85,000 rad of γ-radiation reduced the core flush index after 5 months' storage at 32° F. from 105·3 to 17·1, and the superficial scald index from 27·7 to zero. [For earlier work see *H.A.*, 30: 1776.]—Centr. exp. Fm, Ottawa.

2071. Mikaelsen, K., and Roer, L.
Radiation experiments with potatoes and other plant products in Norway.
Rep. Danish atom. Energy Comm., Risö **16**, 1960, pp. 65-6, bibl. 4.

Irradiation of apples during the pre-climacteric stage increased their storage life. Apples irradiated with 20 to 40 kilorads were firmer with less rotting during storage; the respiration rate was also significantly reduced. Irradiation of unripe green bananas also increased their storage life, but this was accompanied by blackening of the skin.—Agric. Coll. Norway, Vollebekk.

2072. Foschi, S.
La *Sclerotinia* delle pomacee. (***Sclerotinia* infection of pome fruits.**)
Ital. agric., 1960, **97**: 1141-3, illus.

Disinfection of storage receptacles is urged for control of *Sclerotinia fructigena*, using 1 : 300 formalin, hypochlorite liberating 0·8% of active chlorine, or 4–10% commercial sodium carbonate.

2073. de Haas, P. G., and Bünemann, G.
Die wichtigsten Lagerkrankheiten des Apfels und ihre Bezeichnung. (**The chief storage diseases of apples and their distinguishing characters.**)
ErwObstb., 1960, **2**: 210-14, bibl. 13, illus.

Physiological diseases which may occur during cold storage.

2074. Hansen, E., and Mellenthin, W. M.
Controlled atmosphere storage prolongs life of d'Anjou pears, is OSC scientists' report.
Bett. Fruit, 1960, **55**(4): 7, 8, 19.

Control of scald on d'Anjou pears with diphenylamine (DPA) has been variable and has caused side effects. Generally the best results have been obtained with a 2,000 p.p.m. dip or when the DPA was incorporated in wraps at 2 to 3 mg. per wrap. Ethoxyquin as a dip at 4,000 p.p.m. also appears promising. Effective control of scald has been obtained in gas storage by reducing the O_2 content to 2½%. Fruit stored under these conditions at 30° C. has remained scald-free until May or early June. Gas storage with 1 to 2% O_2 effectively controlled mealiness and loss of flavour. Mealiness could also be controlled by using sealed polythene bags.—Ore. St. Coll., Corvallis.

2075. Porritt, S.
Anjou pit.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 6.

Pitting was not increased by storage at 32° F.

2076. Mori, P.
Un insolito marciume su pere "Passa Crassana" in conservazione. (**An unusual rot of Passe Crassane pears in storage.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 160-4, bibl. 6, illus.

Depressed brown spots, resulting in lesions, appeared on the skins of Passe Crassane pears cold-stored with Stark Delicious apples. *Rhizopus nigricans* gained entry and the flesh rotted quickly.—Osserv. Malat. Piante, Verona.

2077. Smith, W. L., Jr., and McClure, T. T.
Rhizopus rot of peaches as affected by post-harvest temperature and moisture.
Phytopathology, 1960, **50**: 558-62, bibl. 9.

For earlier accounts see *H.A.*, 29:167 and 30:293.

2078. Hilkenbäumer, F., Buchloh, G., and Zachariae, A.
Beobachtungen über Veränderungen der Titrationsazidität in Äpfeln während der Lagerung bei verschiedenen Temperaturen. **(Observations on changes in titratable acidity in apples during storage at different temperatures.)** [English and French summaries 12 lines each.]
Gartenbauwiss., 1959, **24**: 1-7, bibl. 6.

Whenever the temperature in a cold store falls below that critical for low temperature breakdown, there is a reduction in acid contents of the fruit and an increase in CO_2 production. If the temperature is reduced still further, so that ice is formed in the fruit tissue, there is initially an increase in titratable acidity, followed after thawing by a rapid decrease in acid contents as brown discoloration develops. It is possible to distinguish frost-damaged apples from those injured during cold storage by determination of the titratable acidity. The rate of loss of acidity in apparently healthy apples is an indication of whether low temperature breakdown may be expected during storage.

2079. Poapst, P. A., and Phillips, W. R.
The influence of temperature on the decline of acidity in McIntosh apples.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 7.
The influence of temperature on the rate of acid loss in McIntosh apples.
Canad. J. Plant Sci., 1960, **40**: 736-44, bibl. 5.

Data are presented which suggest that the rate of loss of total titratable acids during storage varies exponentially with the storage temperature. A formula is given to express this relationship.—Canada Dep. Agric., Ottawa.

2080. Porritt, S.
Effect of temperature on storage quality of pears.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, pp. 5-6.

See *H.A.*, 30: 289.

2081. Meigh, D. F.
Use of gas chromatography in measuring the ethylene production of stored apples.
J. Sci. Food Agric., 1960, **11**: 381-5, bibl. 12, illus.

A method has been developed involving the use of a flame ionization detector and capable of estimating ethylene in 0·5 ml. samples of air at concentrations down to 1 p.p.m. [see *H.A.*, 30: 5635]. Measurements of the rate of ethylene production by apples stored in several CO_2 concentrations showed that high CO_2 concentrations have a greater retarding effect on ethylene production than on CO_2 production. Apples kept at room temperature for a week before storage produced ethylene at an abnormally high rate for the next 80 days.—Ditton Lab., Kent.

2082. Porritt, S.
Influence of container and method of stacking on cooling rate of apples.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 6.

Differences in cooling time and final equilibrium temperatures were significant between wood and cardboard containers, but the major differences were obtained between solidly stacked and spaced containers, the former taking twice as long as the latter to cool to 32° F.—Summerland Res. Stat., B.C.

Fruit utilization.

2083. Wirth, A.
Obst und Obsttrester als Futtermittel. **(Fruit and fruit residues as feeding stuff.)**
Schweiz. Z. Obst- u. Weinb., 1960, **69**: 449-54.

Observations show that in time of fruit glut silage made from fresh apples or pears will be readily eaten by cattle and helps digestion. It can be given in moderate amounts and even as part of the ration for milking cows, provided that the necessary protein is provided from other sources. Fruit residues, such as those from cider factories, contain even less digestible protein than whole fruit but can nevertheless be used to replace part of the normal green ration for stock.

SMALL FRUITS, VINES AND NUTS.

Strawberries.

(*See also* 1750, 1765, 1794, 1806, 1807, 1895, 1902, 2100-2103, 2201, 2202, 2213, 2236, 2334, 3566, 3569, 3576, 3580, 3591, 3595, 3597, 3599, 3607, 3610.)

2084. ZYCH, C. C., AND POWELL, D.
Strawberry growing in Illinois.
Circ. Univ. Ill. Coll. Agric. **819**, 1960, pp. 56, illus.

Including the control of pests and diseases.

2085. STAUDT, G.
The *Fragaria* collection of the Plant Research Institute, Research Branch, Canada Department of Agriculture, Ottawa.
[*Mimeo.*] *Canada Dep. Agric.*, [undated], pp. 15.

Mainly for genetical purposes.

2086. KAŠIČKINA, M. I.
Selection of hybrid strawberry seedlings at an early stage of development. [Russian.]
Bjull. nauč.-tehn. Inf., Mičurinsk, 1959, No. 8, pp. 27-31, illus.

Families of seedlings were graded according to size of roots and shoots, and it was demonstrated that the highest yielding seedlings were those which had made vigorous root and shoot growth at an early stage. Date of fruit ripening was not correlated with vigour classification.

2087. MILLER, P. W., AND WALDO, G. F.
The virus tolerance of *Fragaria chiloensis* compared with the Marshall variety.
Plant Dis. Reptr, 1959, **43**: 1130-1, bibl. 2, illus.

Inoculation studies indicate that *F. chiloensis* may be a good source of virus tolerance for strawberry breeding.—U.S.D.A., and Ore. Exp. Stat.

2088. STEMBRIDGE, G., AND SCOTT, D. H.
Inheritance of resistance of strawberry to the common race of the red stele root rot fungus.
Plant Dis. Reptr, 1959, **43**: 1091-4, bibl. 11.

2089. DAUBENY, H. A.
Relative resistance of some strawberry varieties, species, selections and seedling populations to powdery mildew at Agassiz and Abbotsford, British Columbia.
Plant Dis. Reptr, 1959, **43**: 1253-5, bibl. 2.

Tabulated ratings of resistance to *Sphaerotheca macularis* infection.

2090. VARNEY, E. H., MOORE, J. N., AND SCOTT, D. H.
Field resistance of 29 additional strawberry varieties and selections to Verticillium, 1959.
Plant Dis. Reptr, 1960, **44**: 370-1, bibl. 1.

Cavalier and Siletz were completely resistant to strawberry wilt (*V. albo-atrum*).—N.J. agric. Exp. Stat., New Brunswick.

2091. TODD, J. C.
Two-year strawberry trials confirm value of Cambridge Favourite.
Comm. Gr, 1961, No. 3393, pp. 83, 85.
Favourite gives top yields.
Grower, 1961, **55**: 82-5.

Cambridge Favourite gave the highest yields in 1959 and 1960. Notes are given on the performance of the 13 varieties in the trial.—Nat. Fruit Trial Grounds, Brogdale, Kent.

2092. GOEDEGEBURE, L., AND RUISSEN, J.
Aardbeirassenproeven. (**Strawberry variety trials.**)
Fruitteelt, 1960, **50**: 1321.

The behaviour of 9 varieties in S.W. Holland.

2093. KRONENBERG, H. G., AND WASSENAAR, L. M.
Praktijkproeven met aardbeien in 1957-1959. (**Variety trials with strawberries, 1957-1959.**) [English summary ½ p.]
Meded. Inst. Vered. Tuinbouwgew. **164**, 1960, pp. 15, illus.

Talisman and 4 unnamed varieties were selected for further evaluation under commercial conditions.

2094. LEMAITRE, R.
Étude du rendement de 5 variétés de fraisiers à gros fruits dans le Namurois. (**Yield trial of five large-fruited strawberry varieties in the Namur area.**)
Rev. Agric., Brux., 1960, **13**: 354-6.

Ydun gave the highest and earliest yields; Mme Moutot had the largest berries and was the most frost resistant.

2095. JANICK, J.
Evaluation of strawberry varieties for Indiana.
Res. Bull. Purdue Univ. agric. Exp. Stat. **695**, 1960, pp. 7, illus.

Results of virus-free variety trials covering 4 years are given, including data on yield, earliness, disease resistance, firmness and size. Outstanding varieties were, early: Earlidawn and Vermillion; midseason: Dixieland, Pocahontas and Surecrop; late: Sparkle, Tennessee and Beauty. Vermillion, Surecrop and Beauty are recommended for private gardens.

2096. YOKOMIZO, T., AND SUGIYAMA, C.
A study on the promotion of flower bud differentiation, flowering and fruiting of strawberry plants (Fukuba) by cool storage. [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 25-34.

Flower bud differentiation is induced more rapidly, without damage, when the plants are kept in cool storage with 8 hours of light (5,500 or 1,500 lux) per day than when they are cool-stored in darkness. At temperatures ranging from 6° to 14° C. flower bud differentiation takes place in 6–9 days. When the temperature is raised to 18° C. a longer period of treatment is required.

2097. Bobb, A. C.
Pruning strawberry runners.
Amer. Fruit Gr, 1960, **80**(11): 22, illus.

A Connecticut grower has designed a Triple Air Strawberry Pruner for the removal of excess runners when the matted row system is used. The machine, which is tractor-powered, has a 36-in. rotating cutting blade adjustable from 2 to 10 inches above ground level. This blade is designed to drive air downwards near its centre and suck air upwards at its periphery, thus sucking non-rooted plants into the revolving blade. When sufficient runners have rooted the machine is run over the row at intervals to maintain the desired population. The machine can also be used for the removal of winter mulch.—Univ. Conn., Storrs.

2098. Germing, G. H.
Zwarte folie als grondbedekking bij aardbeien. (**Black plastic as a soil cover for strawberries.**) [English summary 9 lines.]
Meded. Dir. Tuinb., 1960, **23**: 750-4, bibl. 6, illus.

When the weather was dry after planting, a soil cover of black plastic laid at planting time over initially moist soil helped to establish the plants so that the first-year yields were considerably higher than from plants without a soil cover. By the second year, however, yield differences had disappeared. Yields of frame-grown strawberries were not affected by a black plastic mulch.—I.T.T., Wageningen.

2099. Henriksen, A.
Forsøg med udbringningstider og maengder af salpetergødning til jordbaer. 1952-54 og 1956-58. (**Experiments on time of application and levels of nitrate fertilizers for strawberries. 1952-54 and 1956-58.**) [English summary ½ p.]
Tidsskr. Planteavl, 1960, **64**: 449-54.

Calcium nitrate was applied at 200, 400 or 800 kg./ha. to Dybdahl, Freja and Abundance strawberries on 3 soils, either in the spring, during flowering or after harvest. On a heavy loam increased yields were obtained by applications up to 400 kg. On a sandy loam yield increases were only obtained with the vigorous variety Freja. On the light loam yields tended to be slightly lower after application of calcium nitrate. Fruit size was not related to nitrate levels nor to time of application. Runner production increased with nitrate level, particularly after spring applications.—St. Forsøgstat., Spangsbjerg, Esbjerg.

Other small fruits.

(*See also* 1794, 1902, 1904, 3566, 3569, 3591, 3595-3597, 3599, 3607, 3610.)

2100. Kolbe, M. H.
Small fruit culture for home gardeners.
Ext. Circ. N.C. agric. Ext. Serv. **333**, 1960, pp. 8, illus.

Strawberries, dewberries, red and black raspberries.

2101. Roelofsen, B.
De proeftuin voor klein fruit te Kapelle-Biezelinge. (**The experimental garden for small fruits at Kapelle-Biezelinge.**) [English summary ½ p.]
Jversl. Proefst. Fruit. Wilhelminadorp, 1959, pp. 26-33.

Strawberries. Under dutch lights Glasa ripened before Deutsch Evern, while Oranda, although high-yielding, matured too late. Variety trials have shown that Cambridge Vigour, Redgauntlet and Siletz are promising. Irrigation studies showed that the period of greatest need for water is from the start of flowering until the end of the harvest. *Red currants.* Jonkheer van Tets and Maarse's Prominent were the most promising in a variety trial. Yields from Jonkheer van Tets and Fay's Prolific grown as hedges were considerably higher than those from bush plants. *Raspberries.* Malling Promise was the best variety under Zeeland conditions, but Malling Exploit is to be preferred on calcareous soils. With both these varieties yields per sq. m. were highest at the greatest cane density (10 canes per m.). The period of greatest need for irrigation was from flowering to the end of harvesting.

2102. Bould, C.
Nutrient deficiencies in soft fruits: diagnosis and control.
Comm. Gr, 1960, No. 3375, pp. 528-31, illus.

The visual symptoms induced in strawberry, black currant and raspberry by nutrient deficiencies are described, together with those leaf nutrient contents associated with deficiency and sufficiency which are known. Appropriate economic control measures are also described.—Long Ashton Res. Stat., Univ. Bristol.

2103. Jarvis, W. R.
The preservation of fruit chip baskets with copper-8-quinolinate.
Plant Path., 1960, **9**: 150-1, bibl. 5, illus.

One volume of a formulation containing 0·75% copper-8-quinolate and the water repellent Cunilate Wood seal was dissolved in two volumes of industrial white spirit (100° F. flash point). Baskets were dipped in this solution for 8 sec., drained, and allowed to dry for at least 48 hours. The life of baskets so treated prior to continual use for picking soft fruit was extended from 10 days to 10 weeks. In some cases the rotting of Talisman strawberries stored in treated baskets was significantly reduced, but no similar effect was found with Malling Exploit raspberries.—Scot. hort. Res. Inst., Invergowrie, Dundee.

2104. SMITH, W. H.
The application of high concentration of carbon dioxide in transport and storage of some fruits.
Reprinted from *Proc. 10th int. Congr. Refrig., Copenhagen, 1959*, pp. 5, bibl. 4, as *Mem. Ditton Lab.* **7**.

Raspberries travel best when they are pre-cooled to 1·5–4·5° C. and transported in an atmosphere containing 20–25% CO_2; the fruit should be allowed to warm up to 10° C. by the time it reaches the market, to prevent sweating. Black currants may be stored at 1·5–4·5° C. in 50% CO_2 for a period of 4 weeks with almost complete suppression of the growth of micro-organisms; after the first week the CO_2 concentration may be reduced to 25%. The development of low temperature injury in Cox's Orange Pippin apples was delayed when the fruit was subjected to 20–25% CO_2 at 15·5–18·5° C. for a single period of 5 days during storage at —0·5 to ±0° C.

2105. SMITH, W. H.
Observations on the transport of precooled soft fruits in the United Kingdom.
Reprinted from *Proc. 10th int. Congr. Refrig., Copenhagen, 1959*, pp. 2, as *Mem. Ditton Lab.* **6**.

The pre-cooling of soft fruit prior to transport in a ventilated vehicle is suitable only if the fruit is to be marketed locally. When a long journey is necessary the pre-cooled fruit should be placed in an insulated vehicle, with controlled ventilation, containing a small amount of solid CO_2 to allow a slow rise in temperature during the journey (from 1·5 to 10° C.). On removal from the vehicle condensation is then only slight.

2106. ANON.
Mechanical blackberry picker shows promise.
Bett. Fruit, 1960, **55**(4): 4.

The machine, developed by the Oregon blackberry industry in association with the Oregon State College, is built on a frame which straddles a row of bushes. Two steel drums, one on each side of the row, are fitted with rubber bumper bars which shake the vines as the machine moves along, causing the ripe berries to fall onto conveyor belts which collect the berries into crates. The present model is designed to operate with a crew of 3 or 4 and can harvest about ½ an acre per hour.

2107. WILHELMINADORP.
Studiecommissie Blauwe Bessen. **(The Study Group for Blueberries.)**
Jversl. Proefst. Fruit. Wilhelminadorp, 1959, pp. 72-3, illus.
ROELOFSEN, B.
Ervaringen met de blauwe bessenteelt in 1960. **(Experiments on blueberry growing in 1960.)**
Fruitteelt, 1961, **51**: 14-15, illus.

Progress reports are made on the behaviour of several varieties in the soil and climatic conditions of the Netherlands. A trial has shown that hard pruning reduced fruit production, but quality was not affected.—Wilhelminadorp.

2108. LIEBSTER, G.
Hinweise für den Anbau der Kulturheidelbeere. **(Hints on the cultivation of blueberries.)**
ErwObstb., 1960, **2**: 207-10, illus., and 236-41, illus.

All aspects of cultivation in Germany are discussed. The American varieties Earliblue, Blueray, Bluecrop, Berkeley, Herbert and Coville and the German Blauweiss-Goldtraube and Blauweiss-Zuckertraube are found to suit European conditions. The N requirement is 70–110 kg./ha., but may be 50–100% higher where mulching is practised. NPK ratios of 1 : 1 : 1 for mineral and 1 : 2 : 3 for organic soils are recommended, using sulphate of ammonia, superphosphate and K-Mg fertilizers. Where there is an Mg shortage 300–400 kg./ha. of $MgSO_4$ should be added, or on acid soil 500–600 kg./ha. of dolomitic limestone.—Techn. Hochschule, München.

2109. HOLMES, R. S.
Effect of phosphorus and pH on iron chlorosis of the blueberry in water culture.
Soil Sci., 1960, **90**: 374-9, bibl. 12, illus.

Plants were grown in solutions in which the P content ranged from 1 to 60 p.p.m. and the pH from 4 to 8. At a low P concentration and at pH 4 plants showed signs of a P deficiency and were smaller than plants grown at a higher P concentration, but plants grown at the highest P concentration showed incipient iron chlorosis. Plants at pH 4 and 5 made the most growth; at higher pH chlorosis increased and plant size decreased. A high P content appeared to lower the Fe content of the culture solution, producing iron chlorosis in the plant. In young leaves the Fe leaf content decreased with increasing nutrient pH; older leaves showed little variation. When an iron-chelate (FeEDDAA) was substituted for inorganic Fe in the solution, the chlorotic plants became green.—U.S.D.A., Beltsville, Md.

110. Breviglieri, N., and Messerini, A.
Il ribes, coltura industriale da frutto. **(Black and red currants as commercial fruit crops.)**
Frutticoltura, 1960, **22**: 531-9, illus.
Inf. Ortofruttic., 1960, **1**: 130-5, illus.

Brief notes are given on climatic requirements, soil preparation, planting, pruning and training, and harvesting. The numerous varieties briefly described are grouped according to use, i.e., black and ed currants suitable for direct consumption or freezing, and black currants suitable for jam making, canning and syrup production.—Ist. Colt. Arb., Univ. Firenze.

2111. Goedegebure, L., and Ruissen, J.
Rode en zwarte bessen in Kapelle. **(Red and black currants at Kapelle.)**
Fruitteelt, 1961, **51**: 68, illus.

Progress at the Kapelle Experimental Garden for Small Fruits is reported as follows: A spacing of 2 × 1·5 m. was satisfactory for Wellington XXX, and 2 × 1 m. was adequate for Baldwin on most clay soils. In a 3 years' trial Wellington XXX, Baldwin, Malvern Cross, Daniels' September and Akkermansbes were the most productive varieties. Red currants grown on the hedge system gave a higher yield per acre than bush plants; a modification of pruning to leave longer fruiting shoots ensured that the bunches were well separated along the branches.—Proefst. Fruit. Volle Grond, Wilhelminadorp.

2112. Gleisberg, W., and Aumann, H.
Die Flavonole der Schwarzen Johannisbeere. II. Der Gehalt der Wurzeln, Knospen, Triebspitzen und Blätter an Flavonolen. **(The flavonols of the black currant. II. The flavonol content of the roots, buds, shoot tips and leaves.)** [English and French summaries 6 lines each.]
Gartenbauwiss., 1960, **25**: 1-14, bibl. 5, illus.

For part I see *H.A.*, 30: 323.

2113. Rudloff, C. F., and Lenz, F.
Zur Wertigkeit der Johannisbeerblüten. **(The potential fertility of currant flowers.)**
ErwObstb., 1960, **2**: 214-17, bibl. 20, illus.

In studies on black, red and white currants it was found that differences in the ability of flowers to set fruit, and in flower and fruit drop, are related to flower position and development within the vegetative system. Differences in the development of single flowers in the inflorescence are visible during bud differentiation, but are particularly obvious during anthesis. The number of inflorescences and flowers in the buds are markedly affected by the vigour of neighbouring leaves and internodes. In weakly-developing buds and those showing a vegetative tendency, the flowers die soon after differentiation or before bud burst in spring. "Running off" is frequently a result of an unfavourable inflorescence position in the shoot system.—Inst. Obstb. Gemüseb., Stuttgart-Hohenheim.

2114. Skrebtsova, N. D.
Bees increase the crop of black currants. [Russian.]
Pchelovodstvo, 1959, **36**(5): 26-7, from abstr. in *Bee World*, 1960, **41**: 280.

When bees were supplied at 3 colonies per hectare black currant fruit set was 88·3%; at 0·5–0·7 colonies /ha.the set was only 53–59%. An increase in bee population to 9 colonies/ha. did not further increase set as the plantation was not manured.

2115. Modlibowska, I.
Breaking the rest period in black currants with gibberellic acid and low temperature.
Ann. appl. Biol., 1960, **48**: 811-16, bibl. 5, illus.

A single application of GA was successful in breaking the rest period of black currants in September, October and November, while chilling for 2 weeks was insufficient to be effective. The highest percentage of bud burst was obtained by GA application immediately after defoliation. Delay in GA application after defoliation decreased and delayed plant response because penetration of GA was hindered. Multiple and very early GA applications immediately after taking the plants into the glasshouse caused shedding of undeveloped buds. [Author's abstract.]—East Malling Res. Stat., Kent.

2116. Tamás, P.
Untersuchungen zur Charakterisierung der Winterresistenz der Schwarzen und Roten Johannisbeere. **(Studies on the determination of winter hardiness in black and red currants.)**
Züchter, 1960, **30**: 242-7, bibl. 6.

Two methods were used to study winter hardiness in black and red currants: (*a*) direct, by observations in the field and by cold treatment, and (*b*) indirect, by measuring the electrolytic resistance of the diffused solution (the exosmosis method). The results may be summarized as follows: An increase in the rate of exosmosis of electrolytically active substances (expressed as RLF-values, i.e., as the ratio of the electrolytic resistance between the controls and the cold-treated parts of the plants) means an increase in frost susceptibility. The RLF values of shoots from which the buds had been removed satisfactorily reflected the larger varietal differences in frost susceptibility, but no correlation existed between the RLF values of shoots and the frost susceptibility of buds. It was further found that the RLF values increased under the influence of forcing temperatures, and that the rise of the RLF values was greater in the buds than in the shoot tissues. In a study of the relationship between specific electrolytic resistance and rate of development it was concluded that winter hardiness could be increased by combining high specific frost resistance with a slow rate of development. This type of hardiness is found in the red currant variety Laxton's Perfection. In general, red currants showed a much slower rate of development than black currants.—Balsgård, Sweden.

2117. BOUMANS, M.
Zwarte bessen en nachtvorsten. **(Black currants and night frosts.)**
Fruitteelt, 1960, **50**: 1295-6, illus.

Black currant bushes, which were tied in and wrapped in paper for about a week (26 April to 4 May), were adequately protected from night frosts. The cost of the protection was fl. 3·25 per are [about £13 per acre] and yields were increased by 27 kg./are [about 2 cwt./acre].—R.T.C., Roermond.

2118. JENSEN, M.
Irradiation of berryfruit with reference to their industrial utilization.
Rep. Danish atom. Energy Comm., Risö, **16**, 1960, pp. 77-8, bibl. 1.

Irradiation of black currants before juicing reduced the growth of yeasts and moulds, and the ascorbic acid content of the juice seemed to be unaffected. The volume of expressed juice seemed to increase slightly with irradiation doses up to 1,000 kilorad. —Roy. tech. Univ. Denmark, Copenhagen.

2119. SCHULZ, F.
Zehnjähriger Leistungsvergleich bei Stachelbeeren. **(Ten-year gooseberry variety trials.)**
ErwObstb., 1960, **2**: 230-1.

Data on growth, time of picking, yields and effect of pruning for 10 varieties.—Techn. Univ., Berlin.

2120. WILLIAMS, I. H.
Effects of environment on *Rubus idaeus* L. V. Dormancy and flowering of the mature shoot.
J. hort. Sci., 1960, **35**: 214-20, bibl. 9, illus.

At 60° F. raspberry shoots failed to initiate flowers in either a 16-hour or 9-hour day-length. At 55° F. flowers were initiated in some terminal buds in a 9-hour day-length but not in a 16-hour one. At 50° F. flowers were initiated rapidly in both day-lengths. Development of shoots to at least the 15 node stage was shown to be necessary before any flowers were initiated by a short-day induction period. The vegetative stage of Malling Promise could be prolonged to at least 19 months, but Lloyd George developed a terminal inflorescence after 6 months in non-inductive conditions. [For parts I-IV, see *H.A.*, 30: 332.]—Univ. Nottingham Sch. Agric., Sutton Bonington.

Vines—general.

(*See also* 1745, 2310, 3582, 3602.)

2121. MOORE, R. C., AND AROIAN, H. B.
Grape growing in Virginia.
Bull. Va agric. Ext. Serv. **175**, revised 1960, pp. 12, illus.

Varieties, planting, training, pruning, management, plant protection.

2122. VALKOV, C., AND OTHERS.
Maintien de l'équilibre économique en matière de viticulture: (Mesures préventives). Rapports nationaux. **(Maintenance of the economic balance in viticulture. (Preventive measures.) National reports.)**
Bull. Off. int. Vin, 1960, **33**(356): 96-115; (357): 83-99; (358): 84-104; 1961, **34**(359): 74-92.

For other reports in this series, see *H.A.*, 31: 410.

Vines—breeding and varieties.

(*See also* 2129.)

2123. KHAN, K. D. A.
Field scale trials on F_1 grape vine hybrids.
Punjab Fruit J., 1960, **23**: 20-1.

None of the 10 hybrids tested at the Lyallpur Experimental Fruit Garden was suitable for the Punjab in either yield or quality.

2124. HENKE, O.
Biochemische und morphologische Untersuchungen an *Vitis*-Artbastarden. **(Biochemical and morphological studies on *Vitis* species hybrids.)**
Züchter, 1960, **30**: 213-19, bibl. 24, illus.

The paper deals with the flavonoid content and the polyphenol oxidase activity in the foliage of *Vitis cinerea* hybrids, and with the absence of correlations between biochemical and morphological characteristics.—Inst. Obstzücht. Naumburg.

2125. MAZZEI, A. M.
Le uve da tavola in Sicilia nel presente e nell'avvenire. **(Dessert grapes in Sicily now and in the future.)**
Tecn. agric., 1960, **12**: 375-91, illus.

Concentration on growing early varieties, notably Panse, Regina dei Vigneti and Cardinal, is advised.

Vines—propagation and rootstocks.

2126. ČIGRIN, V. N.
Increasing the output of vine transplants from the nursery. [Russian.]
Bjull. nauč.-tehn. Inf., Mičurinsk, 1959, No. 8, pp. 36-40.

The viability of vine cuttings was tested by standing them in water at 15–20° C. until swelling of the buds was visible. Cuttings kept in warm water for 23 days and then graded gave a higher percentage of transplants than those treated by the "kil'čevanie" method of stratification, in which the cuttings are placed upside down with their distal ends kept cold and their proximal ends relatively warm.

2127. Pérez López, A., and Abrams, R.
Effect of growth regulators on the rooting of grape cuttings. [Spanish summary ¼ p.]
J. Agric. Univ. P.R., 1960, **44**: 70-6, bibl. 4, illus.

Although neither IBA nor NAA had any significant effect on the percentage of rooted cuttings produced, the former increased the number of roots per cutting. The length of time the cuttings were kept in sand-beds, however, influenced the rooting percentage and the number and length of the roots, a 10-week period being more favourable than 6 or 8 weeks.

2128. Fleming, H. K.
Concord grape vines transmit productivity.
Progr. Rep. Pa agric. exp. Stat. **217**, 1960, pp. 2, illus.

Individual vine records of number of clusters, pounds of grapes produced and pounds of 1-year wood removed in balanced pruning showed that vines propagated from cuttings of a low yielding plant exhibited the poor producing qualities of the parent, whilst those from cuttings of a normal plant produced relatively high yields of larger clusters. Further experiments with a similar pair of vines over a 6-year period confirmed these results.

2129. Becker, H.
Untersuchungen an hochresistenten Unterlagen. (**Work on highly resistant vine rootstocks.**)
Weinberg u. Keller, 1960, **7**: 291-300, bibl. 9, illus.

An account of vine breeding using *Vitis cinerea* Arnold, a species highly resistant to phylloxera, as pollen variety and the customary rootstocks used in Germany, Berlandieri, Riparia, Aramon, etc., as female parents. Crossing with *cinerea* generally leads to remarkably good phylloxera resistance in the F_1 progeny. Observations have been made on the qualities of the progeny with regard to ripening of wood, compatibility with *vinifera* scions and root formation in different soils. The first trials have now been established to test the behaviour of normal cultivated varieties worked on selected crosses. —ForschAnst. Wein- u. Gartenb., Neustadt/Weinstrasse.

2130. Malan, A. H.
Alphonse Lavallée vines on Jacques rootstocks give good results.
Fmg S. Afr., 1960, **36**(7): 39-40, illus.
le Roux, M. S.
Jacques one of the best rootstocks for Alphonse Lavallée.
Fmg S. Afr., 1960, **36**(8): 52-3, illus.

When Alphonse Lavallée vines were grafted onto the American rootstock varieties Jacques, Richter 99, Teleki, 143B, 3306, 101-14 and 333 the best growth, total grape weight and grape quality were obtained from those on Jacques. This was also so with Waltham Cross vines. There was no significant difference between the sugar : acid ratio of the grapes on the different rootstocks.—W. Prov. Fruit Res. Stat., Stellenbosch.

Vines—climatic factors.

(*See also* 1691, 1692.)

2131. Büchli, A.
Erfahrungen mit dem Decken der Drahtreben mit Strohmatten. (**Covering wire-trained vines with straw mats.**)
Schweiz. Z. Obst- u. Weinb., 1960, **69**: 358-9, illus.
Herstellen von Strohmatten zum Decken der Drahtreben. (**Making straw mats for covering wire-trained vines.**)
Schweiz. Z. Obst- u. Weinb., 1961, **70**: 49-50, illus.

The vines are protected from early spring snow and frost by being covered with straw mats. These are hung over the top wires after the spring work (pruning, tying and spraying) is finished, and have given simple and effective control of frost. In the second article the author describes how the mats are made at a cost of 1.30 francs each [about 2s. 4d.].

2132. Wilhelm, F. A.
Austriebsverzögerung durch Gibberellinsäure zur Verhütung von Spätfrostschäden bei Reben. (**Delaying bud burst in vines with gibberellic acid to avoid damage by late frosts.**)
Dtsch. Weinbau, 1960, **15**: 211-13, from abstr. in *Z. PflKrankh.*, 1960, **67**: 684.

Treatment of Sylvaner and Riesling varieties with GA delayed bud burst by 3 weeks in the following year, but the development of the inflorescence buds laid down subsequently was completely inhibited.

2133. Maxwell, N. P.
Prevention of rain damage in vinifera grapes by use of polyethylene film.
J. Rio Grande Valley hort. Soc., 1960, **14**: 185-6, illus.

Clear polythene sheets stretched over the trellises gave full protection from rain to Perlette and Thompson Seedless grapes during the critical period from the start of the translucent berry stage to maturity. No sun scorch was observed, and after removal of the plastic the vines resumed normal growth.—Tex. agric. Exp. Stat., Weslaco.

2134. de Boixo, P.
De la protection des cultures contre les dégâts des vents à Cuxous (Pyr.-Or.)—Hénon (C.-d.-N.)—Cheraia (Maroc). **(The protection of crops against wind damage at Cuxous (Pyrénées Orientales), Hénon (Côtes du Nord) and Cheraia (Morocco).)**
C.R. Acad. Agric. Fr., 1960, **46**: 585-96, bibl. 5.

Vines at Cuxous benefited greatly from hedges of cypress (*Cupressus sempervirens*) 6–8 m. high and 100 m. apart, planted at right angles to the N.W. winds. Cypress was also an excellent wind-break tree for orange groves in Morocco. The breaks were planted 160 m. apart, beginning 8 m. from the row of orange trees on the windward side of the grove. Eucalyptus was unsatisfactory because it competed too strongly with the crop.

Vines—growth and reproduction.

(*See also* 3565.)

2135. Turković, Z.
Versuche im Weinbau 1959. **(Viticultural experiments 1959.)** [English, French and Spanish summaries 3-4 lines each.]
Mitt. Klosterneuburg, Ser. A, 1960, **10**: 56-60, bibl. 8.

Experimental results are reported from northern Croatia on production costs and on plant factors determining yields. The number of bunches per sq. m. was found to depend on the number of bunches per fruit bud, which varied between 0·8 and 2·5. This number depends largely on the weather from August to autumn of the preceding year. The effects of 3 different spacings were investigated; high training and wide spacing gave the highest bunch weights but close spacing gave bigger yields per hectare. [See also *H.A.*, 29: 3352.]

2136. Nitsch, J. P., and others.
Natural growth substances in Concord and Concord Seedless grapes in relation to berry development.
Amer. J. Bot., 1960, **47**: 566-76, bibl. 21, illus.

Four phases could be distinguished in the growth of the Concord berry: Period O—limited growth and low growth-substance content; Period I—rapid growth and high growth-substance concentration; Period II—marked slowing down in growth and sudden drop in the growth-substance level; and Period III—resumption of active increase in fresh and dry weight with no increase in growth-substance concentration. In Concord Seedless growth of the nucellus and production of growth substances increased faster during Period O than in Concord, but degeneration of the endosperm and reduction in the growth-substance level followed during the middle of Period I. Period II was inconspicuous. Early growth-substance production in both varieties seemed to be associated with nucellus rather than with endosperm development. Some 6 different substances promoting growth in the *Avena* first-internode test could be separated on paper chromatograms. [From authors' abstract.]—Cornell Univ., N.Y.

2137. Branas, J., and Vergnes, A.
Effets des gibberellines sur la vigne. **(The effect of gibberellins on the vine.)**
Progr. agric. vitic., 1960, **154**: 182-91, 220-8, illus.

Gibberellin sprayed over the whole vine stimulated vegetative growth, caused some chlorosis, fruit drop and the formation of some small seedless berries, and markedly reduced yields. Localized applications to the inflorescences alone caused elongation of the bunches without an undesirable effect on fruit set; differences between the test concentrations (50 to 200 p.p.m.) were not important. Fruit set of seedless varieties was much increased.

2138. Kononov, A. V.
The effect of gibberellin on vine inflorescences. [Russian.]
Priroda, 1960, **49**(11): 104-5.

Immersing the inflorescences at the beginning of flowering for 20–30 sec. in 0·0025% GA improved fruit set and, in functionally female varieties, induced parthenocarpy and raised the sugar content of the fruit.

2139. Boehm, E. W.
Cultured sultanas.
J. Agric. S. Aust., 1960, **63**: 481-3, illus.

Methods are described for producing Thompson's Seedless sultanas with berries 50% larger than normal for table use. Strong vines are thinned to 10–20 bunches per vine with the bottom two-thirds of each bunch also removed. About 10 days after full bloom, the butt of the vine may be cinctured or the bunches sprayed with gibberellin (20 p.p.m. plus a wetting agent) at the rate of 80 gal./acre.

Vines—training and pruning.

(*See also* 2135.)

2140. Bernon, G.
Les techniques de la production actuelle du raisin de table en particulier l'évolution Italienne. **(Modern techniques in table grape production, with special reference to developments in Italy.)**
Progr. agric. vitic., 1960, **154**: 236-42, 267-71, bibl. 5, illus.

French, Spanish and Italian systems of training vines are compared. It is concluded that early grapes demand close planting and low training, whereas late varieties benefit by training on trellises or pergolas, provided there is no risk of autumn rost. The economics of establishing the high ypes in France are discussed.

2141. BRANAS, J.
Quelques aspects du mode de conduite de la vigne. **(Some aspects of vine training.)**
Progr. agric. vitic., 1960, **154**: 312-18, illus.

The relative merits of high and low training are discussed. The lower yields from high training, as a result of the wider spacing of the vines, are inevitable, and cannot be significantly raised by leaving longer shoots when pruning.

2142. KONDAREW, M., AND OTHERS.
Der Einfluss des Rebstockabstandes auf den Ertrag bei den Sorten—Roter Muskat, Dimiat, Mawrud und Pamid. **(The effect of spacing on the yields of the vine varieties Red Muscat, Dimiat, Mawrud and Pamid.)**
Mitt. Klosterneuburg, Ser. A., 1959, **9**: 97-108.

In Bulgaria the highest yields per unit area were obtained by close spacing (1–1·25 m. in the row) with both the Becher and Guyot systems of training.

2143. LE ROUX, M. S.
Wide trellises pay dividends in Barlinka grape cultivation.
Fmg S. Afr., 1960, **36**(7): 37-8, illus.

Five-ft. wide verandah trellises in 3 rows of uniform adult vines on rich soil were converted into 8 ft. trellises. The advantages of the latter included a 190% increase in yield of fully developed black grapes, a 74% increase in clippings, 7 boxes of grapes picked at the first picking for every 1 on the narrow trellis, less spoilage and greater fertility of the canes. [See also *H.A.*, 29: 3353.]—W. Prov. Fruit Res. Stat., Stellenbosch.

2144. GREGORY, G. R.
Pruning grapevines.
Agric. Gaz. N.S.W., 1960, **71**: 304-13, illus.

Principles, timing and methods.

2145. AMATRUDA, M.
La taille de la vigne. **(The pruning of vines.)**
Rev. hort. Algér., 1960, **64**(7): 1-63, illus.

This entire number is devoted to descriptions of various methods, with special reference to those used in Algeria.

2146. MALAN, A. H.
The effect of severe pruning on Waltham Cross vines.
Fmg S. Afr., 1960, **36**(8): 36-8, illus.

Vines pruned to 28 and 32 short bearers per plant were compared with vines having 6 long bearers of 7 eyes each, with or without additional short bearers. The length of bearer appeared to have no significant influence on grape quality, but where the fertility of the lower eyes was poor, owing to climatic or soil conditions, a satisfactory crop could not be obtained with only short bearers. In such cases vines should be pruned to leave 7-eye bearers as well as short bearers.—W. Prov. Fruit Res. Stat., Stellenbosch.

2147. NENOFF, S.
Untersuchungen über den Schnitt des Welschrieslings. **(Studies on the pruning of Welschriesling vines.)** (English, French and Spanish summaries 11-13 lines.]
Mitt. Klosterneuburg, Ser. A, 1960, **10**: 61-9, bibl. 23.

The relationship between various pruning methods, yield and quality in Welschriesling vines is discussed. Single-stem and double-stem pruning, with 10–12 or 20–28 buds per plant respectively, are recommended for the Black Sea region.

Vines—soil management and nutrition.

(*See also* 1806, 1868, 1872, 1968, 1970, 2209, 2591.)

2148. PENKOV, M. D.
The distribution of the root system of vines on the main soil types of the Crimea. [Russian.]
Vestn. s.-h. Nauki, 1960, **5**(7): 140-3, illus.

In studies on 4 soil types vine roots developed best in fragmentary soils which had not yet emerged from the second stage of weathering. In southern chernozems and dark-chestnut soils root penetration was shallow, necessitating irrigation, and in calcareous chernozems the depth of root penetration depended on the level of the underlying rock.

2149. MOȚOC, M. D.
Probleme privind dimensionarea teraselor pentru cultura viţei de vie. **(Problems concerning terrace planning for vineyards.)** [English, Russian, French and German summaries 1 p. each.]
Grăd. Via Liv., 1960, No. 6, pp. 16-21 + summaries.

The construction of terraces varied according to the district in which they were situated. Good results were obtained in the steppe and forest steppe regions with earth terraces along the contour lines, 1·5–1·6 m. high with 0–10% platform slopes which were sodded with a mixture of *Onobrychis* and *Agropyron cristatum* or *Yucca filamentosa* and *Iris germanica*. In the cis-Carpathian hilly districts, on tertiary formations with heavy soils, good results were obtained with terraces less than 1·5 m. high with 10–20% platform slopes sodded with a mixture of alfalfa, trefoil and *Dactylis*. The terraces were sloped longitudinally (0–5%) for drainage of surplus water. In vineyards on eruptive rock or on compact calcareous rock terraces with stone walls were constructed.

2150. Constantinescu, G.
Valorificarea terenurilor în pantă prin plantarea lor cu vii. **(Land utilization of slopes by planting with vineyards.)** [English, Russian, French and German summaries ½ p. each.]
Grăd. Via Liv., 1960, No. 6, pp. 6-10 + summaries.

The terracing of strongly eroded and poor sloping land for use as vineyards increased production 10 times compared with that obtained when grain or hay crops were grown. The annual income from vines on terraced land was double that from unterraced land and the crop quality was superior.

2151. Stefanelli, G., and others.
Mécanisation rationnelle de la plantation et de la culture de la vigne. Rapports nationaux. **(Economic mechanization of vine planting and cultivation. National reports.)**
Bull. Off. int. Vin, 1960, **33**(357): 41-64; (358): 8-22.

From Italy, Luxembourg, Morocco and Portugal. [For reports from other countries see *H.A.*, 30: 5073 and 31: 447.]

2152. Danieli, D., and Bertolazzi, B.
Effetti dei lavori superficiali nel miglioramento delle produzioni viticole. **(The effects of shallow cultivation on grape yields.)**
Progr. agric., Bologna, 1960, **6**: 1284-99, illus.

In a 3-year experiment in one irrigated and one non-irrigated vineyard frequent shallow cultivation during the growing season, in addition to a single deep ploughing in winter, gave higher yields and better quality fruit than the traditional system (deep ploughing in winter plus moderately deep cultivation in May and August). The economic advantage was greater in the dry than in the irrigated vineyard.

2153. Putij, V. K.
The cultivation of vines on soils with a high water table. [Russian.]
Sadovodstvo, 1960, No. 6, pp. 36-8, illus.

Riesling vines growing on soils with a high water table (1·75–2·0 m. or higher in the spring) made vigorous root growth in the 20–60 cm. zone. The grapes, however, had a high water content, a low sugar content and an acid flavour. In another vineyard with a high water table yields of Riesling were increased by 18% and those of Saperavi by 27–53% as a result of omitting the traditional preblossom irrigation and irrigating after flowering only when the water table was below 2–2·5 m.

2154. Konlechner, H., and Mayer, N.
Beregnungsanlagen in Hochkulturen. **(The lay-out of irrigation equipment for high-trellised vines.)**
Mitt. Klosterneuburg, Ser. A., 1959, **9**: 120-6, bibl. 1, illus.

A study on the economics of vine irrigation in Austria.

2155. Neururer, H.
Das Unkraut in Weingärten nunmehr auch chemisch bekämpfbar. **(Chemical control of weeds in vineyards.)**
Pflanzenarzt, Wien, 1959, **12**: 24 from abstr. in *Z. PflKrankh.*, 1960, **67**: 695.

2,4-DES and simazine gave satisfactory control, except of certain grasses; monuron damaged the vines.

2156. Lider, L. A., Leonard, O. A., and Lider, J. V.
Field trials with herbicides in vineyards under coastal valley conditions.
Calif. Agric., 1960, **14**(12): 11, 13, illus.

Split applications of diuron and simazine, at 4 lb. active ingredient per acre in mid-winter plus 2 lb. in March, appeared to be more effective than one application (at 4 lb./acre) in mid-winter. Some perennial weeds continued to grow in the treated vineyards.—Univ. Calif., Davis.

2157. Kobayashi, A., and others.
The effects of time and level of application of phosphoric acid and potassium on yield and quality of grapes. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 85-95, bibl. 13, illus.

Phosphate at 80, 40, 20 and 0 p.p.m. and K_2O at 160, 80, 40 and 0 p.p.m. were applied during shoot growth (early April to late June) or during fruit growth (early July to late August) to 3-year-old Delaware vines in sand culture with adequate N (80 p.p.m.). Applications during shoot growth of 80 p.p.m. P_2O_5 greatly improved yield and quality by increasing fruit colour and sugar content while decreasing acidity, and increased the number of flowers per vine and of seeds per berry. When applied during fruit growth this amount of P_2O_5 also increased yield but reduced colour and sugar content without affecting acidity. In the case of 160 and 80 p.p.m. K_2O the early application caused a considerable increase in acidity only and reduced shoot elongation, but the late application improved both yield and colour. Leaf analyses showed the P and K contents to be correlated with the rates of application.

2158. Pfaff, C.
Nährstoffauswaschung aus dem Boden bei Anbau von Reben. **(Leaching of nutrients from vineyard soils.)**
Weinberg u. Keller, 1960, **7**: 225-9, bibl. 2, illus.

An account of 7-year lysimeter trials at the Limburgerhof research station of the Badische Anilin und Soda Fabrik shows that considerable losses rom leaching occur in vine soils at Limburgerhof, specially of nitrogen and potash. This indicates he need for making good such losses by careful anuring, especially in view of the heavy cropping btained with modern cultural methods.

159. DELAS, J., DELMAS, J., AND DEMIAS, C.
Étude par l'emploi de cuivre radioactif de la diffusibilité du cuivre incorporé depuis 70 ans dans les sols viticoles. **(A study, using radioactive copper, of the diffusibility of the copper accumulated over 70 years in vineyard soils.)**
C.R. Acad. Agric. Fr., 1960, **46**: 574-6, bibl. 1.

oil tests showed that approximately one-third of he Cu reaching the soil during 70 years' treatment f vines with copper fungicides remained in a fully iffusible or exchangeable state, and that a considerble part of the remainder became more gradually vailable for root absorption. Thus the greater he accumulation of Cu in the soil, the greater was he toxicity. This accumulation has reached the anger level in the light, acid soils in Bordeaux and vill probably also do so in the more absorptive oils if the applications continue at the same rate. See also *H.A.*, 30: 1884.]

160. GÄRTEL, W.
Zinkmangel bei Reben. **(Zinc deficiency in vines.)**
Weinberg u. Keller, 1960, **7**: 302-11, bibl. 27, illus.

A review of present knowledge on little leaf in the U.S.A. and Australia and of other zinc deficiency ymptoms in European vineyards. Spraying the eaves with a solution of zinc sulphate at a concenration of not more than 0·2% will serve to remedy he condition, and the frequent use of zineb-based ungicides will stop the recurrence of symptoms.

Vines—grape harvesting and drying.

2161. WINKLER, A. J., AND LAMOURIA, L. H.
Mechanical grape harvest.
Calif. Agric., 1960, **14**(11): 14.

Mechanical harvesting of long-stemmed, spurpruned varieties such as Malaga and Aramon can save $21 per acre per annum. Thompson Seedless s less easily handled mechanically. Wider row spacings, up to 18 × 8 ft., and T-shaped trellises will facilitate the use of harvesting machines.—Univ. Calif., Davis.

2162. ROWE, A. H.
The organization of labour in dried vine fruit production.
Quart. Rev. agric. Econ., Canberra, 1960, **13**: 86-94, bibl. 5.

An analysis of the costs of production and drying showed that labour charges accounted for 54% of otal production expenses, and that the production of dried fruit required 160–180 hours/acre. Standards of average labour requirements for the most important production activities are calculated.

Vines—by-products.

2163. MORAND, P., AND SILVESTRE, J.
Vegetable oil based on polyunsaturated fatty acids: oil from grape pips, analytical characteristics and dietary qualities. [French?]
Ann. Falsif., Paris, 1960, **53**: 193-203, bibl. 19, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-227.

Oil from dried grape seeds contained fatty acids, chiefly linoleic (over 50%), oleic, palmitic and stearic, and unsaponifiable matter (chiefly tocopherols). Data on physical, chemical and stability tests showed that the oil compares well with other vegetable oils used in cooking.

Temperate nuts.

(*See also* 1690, 1970.)

2164. SPINA, P.
Il mandorlo specie da valorizzare in coltura specializzata. **(Almonds, a profitable species in monoculture.)**
Inf. Ortofruttic., 1960, **1**: 26-8, illus.

Cultural practices and suitable varieties for various regions of Italy, Sicily and Sardinia.

2165. DEL GAUDIO, S.
Un problema meridionale: il mandorlo. **(Almonds—a problem in southern Italy.)**
Inf. Ortofruttic., 1960, **1**: 98-101, 110-12, illus.

Varieties suitable for export to various European countries are listed, and recent work on manuring, breeding and selection at the Bari Experimental Station is summarized. [See also *H.A.*, 29: 3367.]

2166. LEONE, P.
Orientamenti della mandorlicoltura nella zona litoranea del Siracusano. **(Notes on almond growing in the Syracuse coastal zone.)**
Tecn. agric., 1960, **12**: 57-62, bibl. 4, illus.

Pizzuta and Romana are the principal varieties. It is recommended that there should be more extensive planting of Fascionello Minuta, which shows better graft compatibility with the local wild almond, is a good pollinator for these 2 varieties and has a comparable market value.—Cond. agrar. Noto.

2167. SPINA, P.
Le radiazioni in frutticoltura. Effetti delle radiazioni ionizzanti del cobalto 60 su semi di mandorlo amaro (*Prunus communis*, Arch.). **(Short-wave radiation in fruit growing. The effects of ionizing radiations from cobalt 60 on the seeds of bitter almond.)**
Frutticoltura, 1960, **22**: 573-6.

Germination was delayed for 6–7 days as a result of gamma-ray irradiation of the seeds with 500 r., and for 25 days by 1,000 r. The percentage germination was reduced slightly by the lower, and more markedly by the higher dose. Certain morphological abnormalities in the young seedlings from treated seeds did not prevent normal subsequent growth. In the 8-month-old plants the average height was greatest following treatment with 1,000 r., least following treatment with 500 r., and intermediate in the controls.—Ist. Colt. arb., Univ. Catania.

2168. ANON.
Improvised harvest system.
West. Fruit Gr, 1960, **14**(8): 12, illus.

When heavy rain had caused most of an almond crop to fall, it was harvested from the ground by the use of almond scoops and components of a grape bulk handling system consisting of a 2-wheel trailer holding 2 steel bins and a lift truck equipped with a bin dumper.

2169. ANON.
Grower solves harvest problem.
West. Fruit Gr, 1960, **14**(6): 31, illus.

In a Californian almond orchard the use of a boom shaker combined with a trailer, which accommodated 46 lug boxes in 2 long rows, with canvas sheets to be spread around the tree, enabled 3 men to harvest 25 trees per day, whereas hand knocking allowed 5 men to harvest only 8 trees per day.

2170. IZAKI, M., AND ITAKURA, A.
The influence of the method of treating the soil in the planting hole on the growth of young chestnut trees. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 96-100, bibl. 11.

Large planting holes, 120 cm. in diameter and 90 cm. deep, were used for 1-year-old trees and filled by (1) returning the soil in its original position; (2) reversing the top- and sub-soil; (3) mixing top- and sub-soil; and (4) using top-soil only. Other trees were planted in small holes just able to take them. Measurements of trunk circumference, total shoot length, duration of shoot elongation and root penetration at the end of the first season showed that the trees in the soil returned to its original position had made the best growth, followed by those in holes filled with top-soil only. The trees in holes with reversed top- and sub-soil fared the worst.

2171. PERRAU, A., GUDIN, C., AND RIDÉ, M.
La conservation des châtaignes de semence. (**The storage of chestnuts intended for seed.**)
C.R. Acad. Agric. Fr., 1960, **46**: 549-56, bibl. 2.

Chestnuts of the varieties Bourrue de Juilhac and Marron du Luc were treated with TMTD, methoxyethyl mercuric chloride, basic copper sulphate, and an 8-day water-soaking treatment [see next abstract]. Soaking was highly effective against *Rhacodiella castaneae* in the first variety and considerably so against *Phoma endogena* in the second. The fungicides were ineffective, and *R. castaneae* was stimulated by medium concentrations of the organomercury product. Stratification in sand prevented the development of *Penicillium expansum*. Sorbic acid did not significantly improve the effect of water soaking. Storage under shelter in the open gave better results than in a cellar at 9–12° C. and R.H. > 80%. Germination was rapid in pre-soaked nuts, especially in Bourrue de Juilhac, and was slightly retarded by TMTD.

2172. RIDÉ, M., AND GUDIN, C.
Les procédés de désinfection des châtaignes de consommation. (**Methods of disinfecting chestnuts intended for consumption.**)
C.R. Acad. Agric. Fr., 1960, **46**: 543-9.

In chestnuts of the variety Combale fungal infection (mainly by *Phoma endogena* and *Rhacodiella castaneae*) during 4 months of storage was reduced from 82% to 28% by soaking the nuts in water for 8 days, drying to the natural moisture content (51–54%) and stratifying in sand in a cellar at 9–12° C. In the less susceptible variety Bouche-Rouge, the incidence of storage rots was reduced from 25% to 13% by the same treatment. Subsequent experiments confirmed that shorter periods of soaking were less effective. The 8-day treatment of Combale chestnuts was effective for 3–4 months' storage at 0° C., but only for 1½ months at 10° C. The replacement of static water by running water was no advantage, and for storage at 0° C. was distinctly harmful. The addition of sorbic acid at 1·6 g./l. to the soaking water, to control *R. castaneae*, had a markedly beneficial effect on storage quality at 10° C. but not at 0° C. Fumigation, heat treatment and infra-red treatment all proved unsatisfactory.

2173. COLE, J. R.
Spanish-moss in pecan trees can be controlled by spraying dormant trees with copper sulfate and calcium arsenate.
Plant Dis. Reptr, 1959, **43**: 960-1, illus.

Spanish-moss (*Tillandsia usneoides*) can be eliminated by improving tree vigour with annual fertilizer applications plus winter cover crops. Dormant sprays of 10 lb. copper sulphate and 10 lb. calcium arsenate in 100 gal. killed the moss after annual applications for 3 years.—U.S.D.A., Albany, Ga.

2174. KOUTSOTASSIOS, I.
Cultivation of *Pistacia vera*. [Greek.]
Das. Chron., 1960, **2**: 847-9, illus.

A short account is given of the grafting of a few shoots of the wild *P. vera* on *P. terebinthus* in East

Thessaly. Scion growth has been outstanding (3 m. long in the 2nd year), and in the 3rd year all the trees flowered and set fruit.

2175. Serr, E. F.
Walnut orchards on volcanic soils deficient in phosphorus.
Calif. Agric., 1960, **14**(6): 6-7, illus.
Leaf burning, leaflet dropping and weak growth were consistently associated with a low P content of the leaves. Applications of triple superphosphate on the surface or in trenches 6 in. deep, about 2 ft. from the trunks of young trees and 5 ft. from the trunks of mature trees, increased yields and improved the condition of the trees in all cases.—Univ. Calif., Davis.

PLANT PROTECTION OF TEMPERATE FRUITS.

General.

(*See also* 1827, 1834, 1914, 2084.)

2176. (Western Australia, Department of Agriculture.)
A spraying guide for the control of pests and diseases of fruit trees.
J. Agric. W. Aust., 1960, **1**: 721-35.
Including a compatibility chart of spray materials, a nutritional spray chart, and detailed charts for pest and disease control on apples, pears, stone fruits and citrus.

2177. Powell, D., Meyer, R. H., and Owen, F. W.
Pest control in commercial fruit plantings.
Circ. Univ. Ill. Coll. Agric. **821**, 1960, pp. 44, illus.
Includes disease control.

2178. New Zealand, D.S.I.R., and Department of Agriculture.
Current research, investigation and experiments.
Orchard. N.Z., 1960, **33**: 307-8.
Red mite resistance to organophosphorus compounds is reported. The action of mite ovicides is greatly affected by R.H. Sulphur-based ovicides are more toxic to freshly laid eggs, whereas the action of Kelthane is independent of the age of the eggs. Melprex gave excellent control of apple scab at ½ lb./100 gal. Captan plus stickers equalled bordeaux for control of bitter rot (*Glomerella* sp.) of apples. Apple leaf-curling midge was controlled with 2 sprays of diazinon at 12 oz./100 gals.

2179. Govi, G.
Foglie del melo. (**[Diseases and pests of] apple leaves.**)
Progr. agric., Bologna, 1960, **6**: 966-7, illus.
Brief notes on current Italian methods of controlling mildew (*Podosphaera leucotricha*), scab (*Venturia inaequalis*), leaf spot (*Phyllosticta briardi*), ermine moth (*Yponomeuta padella*), green aphid (*Aphis pomi*) and vapourer moth (*Orgyia antiqua*).

2180. Wade, G. C.
Apricot diseases in Tasmania.
Tasm. J. Agric., 1960, **31**: 242-9, illus.
With recommendations on control measures.

Disorders of uncertain or complex origin.

(*See also* 1947, 1958.)

2181. Hoestra, H., and Kleyburg, P.
Nieuwe gegevens over het herinplantingsprobleem in de fruitteelt. (**New findings on the replant problem in fruit growing.**)
Fruitteelt, 1960, **50**: 1242-3, illus.
The growth of young plants of M.IV apple in "fresh" soil was compared (in preliminary tests) with that in old apple soils given various treatments. Growth was best in "fresh" soil, but that in old apple soil treated with chloropicrin to destroy all types of soil organisms was almost as good. Treatments to control specific soil organisms were less effective. Applications of N or incorporation of apple roots had little effect on growth.—Bedrijfslab. Grond- Gewasonderz., Oosterbeek.

2182. Blodgett, E. C.
Pear decline: progress report from Washington.
West. Fruit Gr, 1960, **14**(10): 15, illus.
Symptoms and possible causes of the disease discussed. [See also *H.A.*, 31: 239.]

2183. Pine, T. S., and Cochran, L. C.
Noninfectious crinkle leaf on Santa Rosa plum.
Phytopathology, 1960, **50**: 701-3, bibl. 3, illus.
This disease, which resembles crinkle leaf of prune and sweet cherry, has been found in S. California. It appears to be a genetic disorder transmissible only by grafting.—U.S.D.A., Riverside, Calif.

2184. Fenne, S. B., and Aroian, H. B.
Black root rot of strawberries.
Circ. Va Polytech. Inst. **858**, 1960, pp. 2, illus.
The various contributing causal factors and preventive measures.

Viruses.

(*See also* 3578, 3611.)

2185. Thornberry, H. H.
Review of information on viral diseases of apples.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 38-43, bibl. 33.

2186. Millikan, D. F., and Guengerich, H. W.
Spy 227, a sensitive indicator for apple viruses.
From abstr. in *Phytopathology*, 1960, **50**: 646.

When compared with other indicators, including Virginia Crab, Lord Lambourne, a *Malus floribunda* selection and the Rosedale strain of *M. platycarpa*, own-rooted Spy 227 proved to be the most sensitive. Depending upon the isolate used for the test, Spy 227 reacts to inoculation with buds from virus-infected trees with foliar symptoms of epinasty or mottle. Isolates containing the stem-pitting virus will produce severe stem pitting.

2187. Schmid, G.
Weitere Beobachtungen über viröse Berostung und Rissbildung an Äpfeln. **(Further observations on virus russeting and cracking of apples.)**
Schweiz. Z. Obst- u. Weinb., 1961, **70**: 32-5, illus.

Inoculation studies indicate that russeting of Boskoop fruits and star cracking of Glockenapfel fruits may be attributed to the same virus. [For earlier work see *H.A.*, 30: 1916.]—Eidg. Versuchsanst., Wädenswil.

2188. Morvan, G., and Castelain, C.
Le dépérissement de l'abricotier. **(Decline of apricot trees.)**
Reprint from *Journées fruit. maraîch. Avignon*, 1959, pp. 65-74, bibl. 3, illus.

The various causes of apricot trees dying in the Rhône valley are tabulated, with notes on control measures. Work done at the St-Genis-Laval Experimental Station on the apricot "decline" virus is summarized. Recommendations for checking this disease include selecting scions from apricots grafted on peach, and avoiding the use of apricot suckers as rootstocks.

2189. Lott, T. B., and Keane, F. W. L.
Twisted leaf and ring pox viruses found in chokecherries near diseased orchards.
Twisted leaf virus indigenous in chokecherry.
Plant Dis. Reptr, 1960, **44**: 326-7, bibl. 2, and 328-30, bibl. 2.

Wild chokecherry (*Prunus virginiana demissa*) was found to be a symptomless host of the apricot ring pox and cherry twisted leaf viruses, and may be a source of infection of orchard trees.—Summerland Res. Stat., B.C.

2190. Lott, T. B., and Keane, F. W. L.
Some seedlings of the Van cherry found to be superior to Bing as indicators for the twisted leaf virus.
Plant Dis. Reptr, 1960, **44**: 331, illus.

2191. Milbrath, J. A.
The epinasty virus reaction of Kwanzan and Shiro-fugen flowering cherry [*Prunus serrulata*].
Phytopathology, 1960, **50**: 495-7, bibl. 6, illus.

The virus causing the reaction is the green ring mottle virus.

2192. Mills, I. K., and Afanasiev, M. M.
Host ranges and latent carriers of Lambert mottle in *Prunus* species.
Plant Dis. Reptr, 1959, **43**: 1098, bibl. 3.

Many commercial cherry varieties and rootstocks were shown to be symptomless carriers of the virus.

2193. Gualaccini, F.
La presenza della maculatura lineare del ciliegio in Italia: sua natura infettiva e sue correlazioni con altre virosi degli alberi fruttiferi. **(The presence of cherry line pattern disease in Italy: its infectious nature and its relationships with other virus diseases of fruit trees.)** [English summary ½ p.]
Boll. Staz. Pat. veg. Roma, 1959 (issued 1960), **17**: 141-68, bibl. 23, illus.

There is evidence that the virus complex involved in cherry line pattern is the same as that producing almond mosaic and apricot line pattern. Mazzard F 12/1 proved to be the best indicator variety for the disease, which is possibly seed-transmitted.

2194. Wilde, W. H. A.
Insect transmission of the virus causing little cherry disease.
Canad. J. Plant Sci., 1960, **40**: 707-12, bibl. 21.

Of 24 species of leafhopper tested under experimental conditions only three, *Macrosteles fascifrons*, *Scaphytopius acutus* and *Psammotettix lividellus*, transmitted the disease; 2 to 4 years were generally necessary for full expression of the symptoms.—Canada Dep. Agric., Summerland, B.C.

2195. Németh, M., and Kegler, H.
Untersuchungen über das Vorkommen von Kirschenvirosen in Ungarn. **(Investigations of the incidence of cherry viruses in Hungary.)** [Russian and English summaries ¼ p. each.]
NachrBl. dtsch. PflSch Dienst, Berlin, 1960, **14**: 110-13, bibl. 11, illus.

Stecklenberg disease was found to infect the sour cherry varieties Pándy and Cigány, ranging in amount from 11 to 62% in different orchards. Pfeffinger disease of sweet cherry occurred to the extent of 12 to 92% on the varieties Germersdorfer and Hedelfinger. Ring spot of sweet cherry was found on Germersdorfer with an incidence of 3 to 80% in different orchards. Symptoms and transmissibility are noted.—Hort. Res. Inst., Budapest.

2196. Klinkowski, M.
Die wirtschaftliche Bedeutung pflanzlicher Virosen. **(The economic importance of plant virus diseases.)**
Angew. Bot., 1960, **34**: 165-78, bibl. 18.

Including recent data on losses from virus diseases in cherries and damsons.

2197. Fridlund, P. R.
Time and temperature requirements for the transmission of the necrotic ring spot virus of *Prunus*.
Plant Dis. Reptr, 1959, **43**: 993-5, bibl. 2.

After budding infected material onto indicator hosts.

2198. Pine, T. S., and Williams, H. E.
Rio Oso Gem peach seedlings as indicator hosts for the Prunus ring spot virus.
Plant Dis. Reptr, 1960, **44**: 324-5, bibl. 7.

As consistent in symptom expression as Shirofugen.

2199. Fulton, R. H., and Cation, D.
Destruction of inoculum or possible transmitting agent of peach rosette mosaic virus by soil drenching with chlordane.
Plant Dis. Reptr, 1959, **43**: 991-2, bibl. 1, illus.

A soil drench of 0·5% chlordane prevented the transmission of peach rosette mosaic virus from the infected soil complex to healthy seedlings. It is not yet clear how the insecticide acts.—Mich. St. Univ., E. Lansing.

2200. Breece, J. R., and Hart, W. H.
A possible association of nematodes with the spread of peach yellow bud mosaic virus.
Plant Dis. Reptr, 1959, **43**: 989-90, bibl. 5.

Possible transmission by *Xiphinema americanum.*

2201. Miller, P. W.
An improved method of testing the tolerance of strawberry varieties and new selected seedlings to virus infection.
Plant Dis. Reptr, 1959, **43**: 1247-9, bibl. 1, illus.

Using a modified leaf-petiole graft technique [see also *H.A.*, 29: 238].

2202. (Durbin, R. D., Castillo, B. S., and King, T. H.)
Virus can be detected in strawberry plants.
Flor. Exch., 1960, **134**(25): 8.

The presence of chlorogenic acid in strawberry plants infected with crinkle or yellows viruses may provide the basis for a test method which is quicker and easier than grafting to indicators.—Univ. Minn.

2203. McGrew, J. R.
Spread of virus into strawberry nursery stocks.
Plant Dis. Reptr, 1959, **43**: 695-6, bibl. 4.

Sampling of field-grown strawberry plants showed that growing the plants in commercial isolation (1,000 yds.) plus frequent insecticide dusting gave satisfactory protection of nursery stock against virus infection. It is recommended, however, that field stocks should be replaced with virus-free foundation stock every 2 or 3 years.—Agric. Res. Serv., U.S.D.A.

2204. Fulton, J. P.
Strawberry virus dissemination in Arkansas.
Phytopathology, 1960, **50**: 477-80, bibl. 16.

Indexing of commercial strawberry fields has shown that most are infected with a complex of viruses. The rates of spread and build-up were much slower than anticipated, and only mottle and vein-banding viruses regularly spread. A large stock of the variety Blakemore which was apparently virus-free was located. [From author's summary.]—Univ. Ark., Fayetteville.

2205. Frazier, N. W., and Thomas, H. E.
Fate of strawberry plants infected with aster yellows virus in nursery beds.
Plant Dis. Reptr, 1959, **43**: 645, bibl 1.

Observations on strawberry plants infected with aster yellows showed that most died shortly after planting out in the field. Some survived longer, but any recovery was temporary.—Univ. Calif., Berkeley, and Strawberry Inst. Calif., Morgan Hill.

2206. Ochs, G.
Mechanische Übertragung der drei Rebvirosen, infektiöse Panaschüre, Blattdeformation und Jaune canare. (**The mechanical transmission of the three vine viruses: panachure, fanleaf disease and yellow mosaic.**) [English, French and Spanish summaries about 5 lines each.]
Mitt. Klosterneuburg, Ser. A, 1960, **10**: 53-6, bibl. 22.

These 3 viruses could be transmitted mechanically by pruning, grafting or root contact. Root infection was found to occur as a result of either contact between 2 roots or of contact between roots and infected plant residues. Infected residues were shown to transmit the diseases even after a period of 3 years.

2207. Raski, D. J., and Hewitt, W. B.
Experiments with *Xiphinema index* as a vector of fanleaf of grapevines. [German summary 6 lines.]
Nematologica, 1960, **5**: 166-70, bibl. 7.

Fanleaf virus was shown to persist in the dagger nematode for at least 30 days. [For earlier work see *H.A.*, 29: 2282.]—Univ. Calif., Davis.

2208. Scaramuzzi, G.
La degenerazione infettiva ed i suoi riflessi sulla viticoltura siciliana. (**Infectious degeneration and its repercussions on Sicilian viticulture.**)
Tecn. agric., 1959, **11**: 575-91, illus.

There are indications that the virus of infectious degeneration may be transmitted in infected soil, the strongest evidence pointing to *Xiphinema* and *Criconemoides* spp. of nematodes as vectors. If control measures are to be successful, the two essential preliminaries must be the precise definition of symptoms for each variety and locality, and the establishment of pilot nurseries for the distribution of healthy stock.—Univ. Catania.

2209. (Goheen, A. C., and Cook, J. A.)
Saving grapes by stopping leafroll.
Agric. Res., Wash., 1960, **9**(3): 6-7, illus.

Leafroll virus is now believed to be the same as rougeau, flavescence, brunissure, red leaf and blattroll Krankheit. It interferes with the movement of K within the vine and may be confused with K and Mg deficiencies. Methods of distinguishing between the 3 disorders, visually and by tissue analysis, are described.—Univ. Calif., Davis.

2210. Pieri, G.
Ricerche sul "giallume infettivo" della vite. **(Investigations on vine infectious yellows.)**
Riv. Vitic. Enol., 1960, **13**: 295-7, bibl. 4.

Scions from diseased vines of the variety Castelli romani were grafted on healthy 420A (Berlandieri × Riparia) rootstocks, and healthy 420A scions on diseased Castelli romani rootstocks. In both combinations a bud was left on the rootstock near the union. In the first combination it was not until the 3rd season that the "infectious yellows" appeared in the branch developing from the rootstock, while the surrounding herbaceous plants were unaffected. In the second combination the symptoms appeared in the scion during the 2nd season, by which time the surrounding herbaceous plants had also developed the disease. Thus the virus nature of the disease was confirmed, and there was evidence that it can be soil-borne.

Bacteria.

(*See also* 2224, 2236, 2245.)

2211. (Brodrick, H. T.)
Bacterial spot disease of stone fruits discussed.
Agric. News, reprinted in *Dec. Fruit Gr*, 1960, **10**: 179.

The causal organism was isolated and found to resemble *Xanthomonas pruni* [see also *H.A.*, 30: 412]. Best control was obtained with bordeaux, Coppercote and captan.—W. P. Fruit Res. Stat., Stellenbosch.

2212. Saure, M.
Über die Ursache von Zweigsterben und Gummifluss an Süsskirschen im Alten Land. **(On the causes of die-back and gummosis of sweet cherries in the Altes Land.)**
Mitt. ObstVersuchsringes Jork, 1960, **15**: 215-20, bibl. 5, illus.

Infection with *Pseudomonas mors-prunorum* produced characteristic symptoms.

2213. Kennedy, B. W., and King, T. H.
Angular leafspot, a new disease of strawberry.
From abstr. in *Phytopathology*, 1960, **50**: 641-2.

The disease appears to be bacterial in origin. Defoliation was severe where sprinkler irrigation was used and indications were that plants growing with adequate fertilizer were more susceptible than plants growing where N, P or K was deficient.

2214. Ochs, G.
Bacterium gracile als Erreger der Lahmstielkrankheit bei Ertragsreben und Tafeltrauben. **(*Bacterium gracile* as the pathogen of shanking in wine and table grapes.)**
Mitt. Klosterneuburg, Ser. A., 1959, **9**: 95-7, bibl. 1.

In extensive tests to determine the cause of shanking *Bacterium gracile* was shown to be the pathogen. Modern organic fungicides did not control the disease, but a 0·5% copper-vitriol-lime mixture, applied at the time of the last pre-harvest spray, had a satisfactory bactericidal action.

Fungi.

(*See also* 1819, 1999, 2072, 2171, 2172, 2178, 2179, 2314, 2315, 3569, 3578, 3591, 3610, 3611.)

2215. Terui, M., and Kagawa, H.
Control of the monilia-disease of apples with antibiotics.
Bull. Fac. Agric. Hirosaki Univ., 1960, No. 6, pp. 1-4, bibl. 8, illus.

Artificial pollination of flower buds of apples with a mixture of pollen grains and griseofulvin dust effectively controlled fruit rot caused by *Sclerotinia mali.* [See also *H.A.*, 29: 254.]

2216. Hockey, J. F.
Calyx-end rot of apples.
Plant Dis. Reptr, 1959, **43**: 804-5, bibl. 5, illus.

A calyx-end rot of apples caused by *Sclerotinia sclerotiorum* is present in sod-mulch orchards in Nova Scotia. Linda, McIntosh and Red Rome Beauty have been the varieties most seriously affected. Infection takes place by ascospores produced in the spring from sclerotia overwintering in the mulch or on fallen fruit. It is suggested that a fungicide should be applied as the apothecia mature, and a special late-bloom application may be necessary when conditions favour apothecia production.—Canada Dep. Agric., Kentville, N.S.

2217. Dickens, L. E., and Henderson, W. J.
Comparative treatments for powdery mildew of apple.
Plant Dis. Reptr, 1959, **43**: 1263.

Control of *Podosphaera leucotricha* was more than 80% when Karathane (at $\frac{3}{4}$ lb./100 gal.) or micronized wettable S (at 6 lb./100 gal.) was applied from the cluster-bud stage at intervals of not more than 14 days.—Colo. St. Univ., Fort Collins.

2218. Foschi, S.
Il mal bianco del melo. **(Apple mildew.)**
Inf. Ortofruttic., 1960, **1**: 91-2, illus.

Control with Karathane and sulphur [see also *H.A.*, 29: 2292].

2219. Roosje, G. S.
Het mycologisch onderzoek. **(Mycological studies.)** [English summary ½ p.]
Jversl. Proefst. Fruit. Wilhelminadorp, 1959, pp. 41-5, illus.

Apple scab. At 0·2% Aacuram [cetylpyridinium dimethyldithiocarbamate] was as effective in curative control as 0·057% Cyprex; at 0·1% Cyprex was better than 0·2% Aacuram and was about as effective as Aaventa (an organic Hg preparation) at 0·07%. Aacuram in the field was rather more phytotoxic to pear leaves than Cyprex at the same concentration of active ingredient. *Apple mildew.* Attempts to base control on possible infection periods were not satisfactory; only weekly sprays with 0·06% Karathane from pink bud until the autumn gave adequate control. A correlation was observed between fruit russeting and mildew infection. Infection of terminal buds took place in July. Karathane appeared to inhibit red spider development, and had no detrimental effect on the storage quality of Jonathan.

2220. Meijneke, C. A. R.
Het schurftonderzoek in Nederland van 1955 t/m 1958. V. Slotbeschouwingen en samenvatting. **(Scab research in Holland from 1955 to 1958. V. Conclusions and summary.)** [English summary 1 p.]
Meded. Dir. Tuinb., 1960, **23**: 755-64, bibl. 4.

The author discusses information published in the earlier papers of this series [see *H.A.*, 30: 5134, and 31: 511] in relation to the determination of infection periods and the preventive control of scab.—PlZiektDienst., Wageningen.

2221. Dexter, P. M.
New chemical effective against black spot.
Fruit World, Melbourne, 1960, **61**(8): 43.

Field trials have shown Melprex to be effective both as a protectant and an eradicant against apple and pear scab. Recommendations for use as a protectant are: ½ lb. per 100 gal. applied as a spray every 10–14 days, starting pre-blossom; where the disease is well under control later sprays may be reduced to 5 oz. per 100 gal. As an eradicant Melprex should be applied at ¾ lb. per 100 gal. At ½ lb. per 100 gal. Melprex is cheaper than captan.—I.C.I.A.N.Z. Merrindale biol. Res. Stat., Croydon.

2222. (Skepper, A.)
Black spot of apples and pears.
Fruit World, Melbourne, 1960, **61**(5): 17.

A recommended scab control programme consists of a 0·01% phenyl mercuric chloride spray, applied after harvest and before leaf-fall. A neutral spreader should be added to the spray mixture. In spring either a series of PMC sprays immediately following infection or a series commencing at the pink or white bud stage should be applied. PMC must not be applied within 4 months of harvest.

2223. Desmarteau, R.
The use of dichlone against apple scab.
A.R. pomol. Fruit Growing Soc. Que., 1959, pp. 91-6, bibl. 14.

In Quebec 5–6 sprays of dichlone (¼ lb./100 gal.) up to and including the calyx stage, followed by captan, ferbam or glyodin for the rest of the season, gave effective control of apple scab with only slight russeting.

2224. Powell, D.
Evaluation of fungicides for the control of apple diseases in Illinois in 1959.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 43-9.

Dodine 65W (Cyprex), ½ lb. per 100 gal., was equally efficient in scab control as 2 lb. of captan 50W, and caused fruit russeting only on Golden Delicious when used in the summer in 1 orchard. According to the severity of the disease, ¼ lb. or ¾ lb. could be used without deleterious effects. Dyrene, 2 lb. per 100 gal., caused severe fruit russeting. As the post-blossom use of streptomycin to control fireblight is not approved, 14 applications of ½–1–100 bordeaux mixture between 26 May and 20 July were tested and reduced the number of blighted twigs on Jonathan from 145·8 to 52 per tree.

2225. Rich, A. E.
Bis-(3,4-dichloro-2(5)-furanonyl) ether, a promising new nonmercurial fungicide which exhibits both protectant and eradicant properties.
Plant Dis. Reptr, 1960, **44**: 306-8, bibl. 2.

After successful preliminary pre- and post-infection greenhouse trials, the new fungicide GC-2466 (or mucochloric anhydride) gave promising results in field trials for the control of apple scab (*Venturia inaequalis*) and tomato early blight (*Alternaria solani*). For example, the incidence of leaf and fruit scab was 3 and 5% respectively with 1 lb. 50% WP GC-2466, 4 and 1% with 1 lb. 50% WP captan and 33 and 53% in the control. The rates of tomato defoliation were 20 and 9% with 1 lb. 50% WP GC-2466 and 1 lb. 65% WP maneb respectively, compared with 76% in the control. There are indications that the fungicide has a slight systemic action.—N.H. agric. Exp. Stat., Durham.

2226. Heuberger, J. W., and Albert, J. J.
Lead arsenate as a summer fungicide on apples for control of secondary scab, *Botryosphaeria* fruit rot, and sooty blotch.
From abstr. in *Phytopathology*, 1960, **50**: 571.

Spraying the variety Rome with 1·5 lb. lead arsenate plus 1·5 lb. lime [per 100 gal.] from the end of May until the middle of September reduced the incidence and severity of all 3 diseases and improved the fruit finish and colour of the foliage. When used in conjunction with fungicides the arsenate and lime improved control of the 3 diseases. Spraying with nabam + lead arsenate + lime from the beginning of June until the middle of August gave better control of sooty blotch than captan + zineb on Jonathan, Red Delicious, Golden Delicious and Stayman. Only in the case of Golden Delicious did the nabam combination injure the foliage and fruit. [For earlier work see *H.A.*, 30: 514.]

2227. CARTER, M. V.

Further studies on *Eutypa armeniacae* Hansf. and Carter.

Aust. J. agric. Res., 1960, **11**: 498-504, bibl. 5, illus.

A study of the mode of penetration of the host [apricot] by germinating ascospores of *E. armeniacae* has provided an explanation for the failure of fungicides to prevent infection of wounds. Experimental evidence indicates that the susceptibility of wounds made during the dormant period decreases during the subsequent growing season. Additional information concerning spore production is presented and some new hosts are listed. [Author's summary.]—Waite agric. Res. Inst., Adelaide.

2228. OGAWA, J. M., AND ENGLISH, H.

Relative pathogenicity of two brown rot fungi, *Sclerotinia laxa* and *Sclerotinia fructicola*, on twigs and blossoms.

Phytopathology, 1960, **50**: 550-8, bibl. 30, illus.

Cankers produced by *Sclerotina laxa* and *S. fructicola* on Drake and Mission (Texas) almond, Royal apricot, Quetta nectarine, Italian prune and Walton peach showed, in general, a similar reaction to seasonal conditions. *S. laxa* produced longer cankers than *S. fructicola*. Air temperature and canker length were correlated. Gumming produced on the inoculated area apparently was related not to host resistance but to inoculation when the cambium was active. Cankers were longest on almond, followed in order by apricot, peach and nectarine. Blossom inoculations showed no distinct differences in pathogenicity between *S. laxa* and *S. fructicola*, though the latter generally produced somewhat more blossom blight. Closed blossoms were less susceptible to blossom blight than open blossoms. Separate inoculation of various floral parts showed that the stigma was most susceptible to infection and, when infected, led to the greatest amount of blossom blight. The likelihood of inducing blossom blight by inoculating other floral parts was greatest for anthers, followed by filaments, petals of unopened blossoms, floral tubes of closed blossoms, and petals of open blossoms. Pollen-laden floral parts were more prone to infection. The blossoms of peaches and almonds were markedly less susceptible to infection before than after opening, whereas those of plums and apricots showed little or no difference in susceptibility with openness. [From authors' summary.—For earlier work see *H.A.*, 24: 1347.]—Univ. Calif., Davis.

2229. OGAWA, J. M., AND WILSON, E. E.

Effects of the combination of sodium pentachlorophenoxide and liquid lime-sulfur on the brown-rot fungi.

From abstr. in *Phytopathology*, 1960, **50**: 649.

A spray of 8 lb. of 37% sodium pentachlorophenoxide (SPCP) and 11·2 gal. of 32° Baumé liquid lime-sulphur was more effective than SPCP alone in suppressing conidial development of the brown-rot fungi. The superiority of the combination was particularly marked when the spray was applied during the early part of the dormant season. On *Prunus amygdalus* and *Prunus persica* var. *nectarina* the combination drastically reduced sporodochial production by *Sclerotinia laxa* on blighted blossoms and twigs.

2230. CICCARONE, A.

Che cosa è e come si combatte il marciume bruno del mandorlo (*Prunus amygdalus* Stokes). **(Almond brown rot and its control.)**

Tecn. agric., 1960, **12**: 103-13, bibl. 7, illus.

The control measures practised in different parts of Italy are reviewed. The calendar for the control of *Monilia laxa* is summarized as follows: (1) removal of dead and diseased shoots and mummified fruits between harvest time and leaf fall; (2) optional autumn spray with 1·5% bordeaux; (3) winter spray with 2–3% bordeaux or Na pentachlorophenate (not satisfactory in Sicily); (4) spray at pink bud stage with 1·5% bordeaux or 0·6–0·7% zineb or captan; (5) in very wet or cold seasons spray with weak alkaline bordeaux (0·4 kg. copper sulphate and 0·5 kg. slaked lime per 100 l.) or 0·25–0·30% zineb or captan when 10–15% of the flowers are open; (6) spray at full blossom with 0·25–0·30% zineb one or more times; (7) post-floral spray with 0·25–0·30% zineb. [See also *H.A.*, 30: 1938.]—Ist. Pat. veg., Univ. Bari.

2231. COLE, J. R.

Scab can be controlled on the Schley variety of pecan in central Georgia with proper timing and thorough spraying.

Plant Dis. Reptr, 1959, **43**: 658.

Scab (*Fusicladium effusum*) in a pecan orchard was effectively controlled by schedules involving 6 summer applications of ziram + oil, bordeaux, or zineb + oil. Trees sprayed with bordeaux produced the most nuts (lbs. per tree), but quality (evaluated as nuts per lb.) was not better than from trees sprayed with ziram. Dormant applications of Puratized Agricultural Spray [tris(2-hydroxyethyl)(phenyl mercury)ammonium lactate] did not improve the control obtained with ziram + oil.—U.S.D.A., Albany, Ga.

2232. Barnes, G.

Effectiveness of certain protectant fungicides for control of pecan scab in Oklahoma during 1959.

From abstr. in *Phytopathology*, 1960, **50**: 574.

Zineb fungicides (Parzate and Dithane Z-78, both at 3 lb. per 100 gal., and zineb tank mix), Cyprex at 1 lb. per 100 gal. and Dyrene at 4 lb. per 100 gal. all gave excellent control, and low-lime bordeaux (6–2–100) gave good control of *Fusicladium effusum*. All the fungicides increased the nut size considerably. [For earlier work see *H.A.*, 29: 2308.]

2233. Schofield, E. R.

Black currant leaf spot and its control in the West Midlands.

Agriculture, Lond., 1960, **67**: 250-2.

Control of *Pseudopeziza ribis* was obtained in a 2-year trial by 4–5 pre-picking sprays of zineb, 2 lb. 75% w.p./100 gal., at the rate of 200 gal./acre, plus 1 post-picking spray. Infection was reduced by 40% and 60% in the 2 years respectively. If a complete spray programme is not possible, sprays should be applied in mid-May, mid-June and immediately after picking.—N.A.A.S., Evesham.

2234. Miller, P. M., and Stoddard, E. M.

Control of grey mold on strawberries.

Plant Dis. Reptr, 1959, **43**: 646-8, bibl. 2.

See *H.A.*, 29: 3428.

2235. Powelson, R. L.

Initiation of strawberry fruit rot caused by *Botrytis cinerea*.

Phytopathology, 1960, **50**: 491-4, bibl. 15, illus.

Isolations and histological studies have shown that *Botrytis* mycelium is present in senescent petals, stamens and calyces of marketable fruit. Plants grown in the greenhouse under conditions favouring severe disease development were less frequently attacked by *Botrytis* if petals, stamens and calyces were removed after fertilization. Three pre-harvest applications of 3 lb. captan 80% w.p. per 100 gal. per acre significantly reduced rot incidence in the field, and also the amount of latent infection of marketable fruit. [From author's summary.]—Ore. St. Coll., Corvallis.

2236. Vaughan, E. K.

Influence of fungicides on microorganisms associated with apparently healthy strawberries.

From abstr. in *Phytopathology*, 1960, **50**: 657-8.

Botrytis cinerea and occasionally bacteria and other fungi could be isolated from inside apparently healthy strawberries. The concentration was greatest near the stem end of the fruit and decreased toward the tip. Under Oregon conditions fungi were most numerous in the berries of the earliest and latest pickings. Captan sprays applied during and just after blossoming for control of fruit rot reduced the populations of both fungi and bacteria in the apparently "disease-free" berries. NAA sprays applied to increase the size of the fruit had no effect on the incidence of either obvious or latent infections. Results were variable with post-harvest fungicidal dips. Captan and Harven reduced not only the incidence of visible rots but also the numbers of fungus and bacterial colonies obtained from within apparently healthy fruit. Unless dips were followed by rapid drying and prompt refrigeration, both incidence of rots and populations of internal microorganisms were greater in treated than in untreated berries.

2237. Carver, R. G., and Horn, N. L.

Summer killing of strawberry plants caused by *Colletotrichum fragariae*.

From abstr. in *Phytopathology*, 1960, **50**: 575.

Killing was very much reduced in soils treated with methyl bromide compared with untreated soils.

2238. Basu, P. K.

Verticillium disease of strawberries.

Canad. J. Bot., 1961, **39**: 165-96, bibl. 25, illus.

Although this study is largely mycological, experiments are described which demonstrated that current year runner plants are virtually immune from infection by *Verticillium albo-atrum*, even when they remain attached to the mother plants and root in infested soil. After overwintering they make rapid vegetative growth followed by flowering and, by this time, have become susceptible.—Univ. Toronto, Ont.

2239. Konlechner, H., and Mayer, N.

Ergebnisse von Versuchen zur Bekämpfung von *Botrytis cinerea* auf Trauben. **(Results obtained in the experimental control of *Botrytis cinerea* on grapes.)**

Mitt. Klosterneuburg, Ser. A., 1959, **9**: 85-91, bibl. 8.

Prophylactic treatment of vines with certain fungicides, especially Phaltan, greatly reduced the incidence of berry rot caused by *Botrytis cinerea*. The effectiveness of the chemicals in inhibiting the fungus was shown to increase with their adhesive capacity.

2240. HARVEY, J. M.
Reduction of decay in storage grapes by field applications of captan.
Plant Dis. Reptr, 1959, **43**: 889-92, bibl. 3.

Captan dusting of grape clusters effectively reduced infections of *Botrytis cinerea*, *Cladosporium herbarum* and *Alternaria* spp. Three applications were given at monthly intervals from mid-July, before rainfall. A single application after rainfall was not effective.—U.S.D.A., Fresno, Calif.

2241. FRIGATO, V., AND VALENZA, F.
Essais expérimentaux avec fongicides organiques sur vigne effectués à San Martino di Rosignano Monferrato en 1959. (**Experimental trials with organic fungicides on vines carried out at San Martino di Rosignano Monferrato in 1959.**)
Fruits et Prim., 1960, **30**: 29-33.

Zineb, phaltan and captan were compared with copper sulphate for the control of downy mildew (*Plasmopara viticola*) on Barbera, 9 treatments being applied between 11 May and 19 August in accordance with the local timetable. Best control was obtained with 0·1% phaltan (2·6% infected leaves), followed by 0·3% zineb (2·98%) and 0·15% captan 83% (3·36%). Maximum must production was given by 0·3% zineb but good production was also obtained with 0·15% phaltan and with 0·10 and 0·15% SR 406. Production was much greater with phaltan than with copper. Must density was considerably lower with zineb (2·4° Babo lower) than with copper, but was higher with phaltan than with copper.

2242. KUNDERT, J.
Die Peronospora der Rebe und ihre Bekämpfung im Jahre 1960. (**Vine downy mildew and its control in 1960.**)
Schweiz. Z. Obst- u. Weinb., 1961, **70**: 4-10.

New experimental data on the effects of zineb, maneb and copper sprays, but no new recommendations. [For the 1959 report see *H.A.*, 30: 1951.]

2243. SCARAMUZZI, G.
Norme pratiche per un efficace calendario di trattamenti contro la peronospora e l'oidio della vite in Sicilia. (**Practical rules for an efficacious calendar of treatments for control of vine downy mildew and powdery mildew in Sicily.**)
Tecn. agric., 1960, **12**: 127-45, illus.

Recommendations are made for combined control. Downy mildew (*Plasmopara viticola*): The first treatment should be applied when the shoots are 10 cm. long. Treatment should be repeated whenever water touches the leaves. The spray should consist of a zineb formulation plus colloidal sulphur (the latter for the control of powdery mildew), but bordeaux mixture can be used alone for the final treatments in September. During flowering and fruit colouring copper-containing sulphur dust or sulphur plus zineb dust should be used. Powdery mildew (*Uncinula necator*): At least 4 treatments with sulphur dust should be applied at each of the following stages: (1) during bud burst; (2) during flowering; (3) during fruit colouring (in this and the previous case preferably copper-containing sulphur or sulphur plus zineb dust); (4) towards the end of August. All other treatments can be combined with the downy mildew treatments.

2244. HARVEY, H. L.
Powdery mildew or oidium of grapes.
J. Agric. W. Aust., 1960, **1**: 747-9, illus.

Preventive measures include dusting or spraying with sulphur (5–10 lb./acre) when shoots are 2–4 in. long, 3 weeks later, and immediately after fruit set. Further applications should be made at 10-day intervals during showery or cool weather.

2245. STELLWAAG, F., AND OTHERS.
Lutte contre certaines maladies cryptogamiques de la vigne (oïdium, esca, excoriose). (**Control of some fungus diseases of vines (powdery mildew, esca, excoriosis).**)
Bull. Off. int. Vin, 1959, **32**(341): 76-84; (342): 15-62, bibls; (343): 6-19, bibl. 1.

The series of national reports comprises those from (1) Germany, Argentina and Austria, (2) Chile (on powdery mildew, anthracnose (*Elsinöe ampelina*) and bacterial collar galls), Spain, France, Greece and Italy, and (3) Luxembourg and Portugal. Control of powdery mildew (*Uncinula necator*) is effected mainly by various sulphur treatments, but polysulphides are not generally recommended. In some instances potassium permanganate has given good results. In Chile very promising action was shown by Actidione. In Portugal 0·5% sodium carbonate proved effective, and the report gives details of a still more effective treatment with 0·2% sulphurous acid. In various countries the replacement of copper fungicides by dithiocarbamates for control of downy mildew has notably increased the incidence of powdery mildew. Resistant varieties are listed for several countries. The disease known as esca or apoplexy, attributed to *Stereum* spp. and *Polyporus* (*Fomes* or *Phellinus*) *igniarius*, is controllable by winter treatments with sodium arsenite or related compounds, particularly if these immediately follow careful surgical removal of the diseased bark. In Spain, where soft soap is added to the solution, a single treatment is effective for 2–3 years. In Greece the solution must be weaker than in countries with cooler climates. Non-dormant buds are injured by arsenical compounds. The disease has not been reported in Germany, Austria, Luxembourg or Argentina, and is rare in Portugal. Excoriosis, caused by *Phoma flaccida* (a form of *Guignardia baccae*), is absent from Portugal, Germany and Austria, and rare in Argentina. In Italy, and until recently in France, control has been achieved by winter treatment with acidified ferrous sulphate, followed just before bud burst by bordeaux mixture. Recent work in France has shown that the bordeaux treatment is uneconomic, that DNOC or yellow anthracene oils are effective and that the best results are attained by a single winter treatment with 5% sodium arsenite. Bacterial collar gall [possibly *Bacterium tumefaciens*] is controlled in Chile by sprays of either DNOC or iodine in methyl alcohol, and by rendering the soil slightly acid.

2246. BRANAS, J.
Sur l'apoplexie de la vigne. (**Apoplexy of vines.**)
Progr. agric. vitic., 1960, **154**: 287-94, illus.

The fungi *Stereum hirsutum*, *S. purpureum* and *Phellinus igniarius*, causing apoplexy of vines, are controlled to some extent by limiting the number and size of pruning wounds. Very good results have been obtained by spraying the wounds with a sodium arsenite solution, diluted to give 1·25 g. of As per hl. The treatment should be repeated, if necessary annually, but should not be carried out after the application of oil-based preparations.

Nematodes.

(*See also* 1705, 1871, 2200, 2207, 2208, 2888, 3013.)

2247. FOSTER, H. H.
Identification and preplant control of parasitic nematodes attacking peach trees in South Carolina.
From abstr. in *Phytopathology*, 1960, **50**: 575.

Over 2 seasons pre-planting treatment with dibromochloropropane, ethylene dibromide or methyl bromide gave significant increases in the shoot length and trunk circumference. Root galling was reduced and the treatments tended to prevent the early stunting of trees.

2248. LOWNSBERY, B. F.
Studies of the nematode, *Criconemoides xenoplax*, on peach.
Plant Dis. Reptr, 1959, **43**: 913-17, bibl. 12, illus.

DD fumigation at 40 gal. per acre gave a good kill of nematodes in an old peach orchard; the species present were *Criconemoides xenoplax*, *Pratylenchus vulnus* and *Meloidogyne javanica javanica*. Growth in the first season of Red Haven peach trees planted on treated sites was significantly greater than that of trees planted on untreated sites. Greenhouse studies showed that the final weights of peach seedlings after 3 months' growth in pots inoculated with *C. xenoplax* were not related to the numbers of nematodes added initially. Populations of *C. xenoplax* were highest in winter and early spring, and damage to peach trees, if it occurs, is probably greatest then.—Univ. Calif., Davis.

2249. HUTCHINSON, M. T., REED, J. P., AND RACE, S. R.
Nematodes stunt blueberry plants.
N. J. Agric., 1960, **42**(4): 12-13, illus.

Similar species of nematodes, mainly *Trichodorus* sp. and to a lesser extent *Tetylenchus joctus*, were found associated with both wild and cultivated plants. Drench applications of VC-13, 75% e.c. at 10–20 gal./acre, controlled the former in beds of cuttings.

2250. MINISTRY OF AGRICULTURE, LONDON.
Eelworms on strawberries.
Adv. Leafl. Minist. Agric., Lond. **414**, revised 1960, pp. 8, illus.

Control of *Aphelenchoides fragariae*, *A. ritzema-bosi* and *Ditylenchus dipsaci* by hygiene, hot water treatment or parathion.

2251. COLBRAN, R. C.
Strawberry root-knot nematode investigations in Queensland.
Qd J. agric. Sci., 1959, **16**: 365-70, bibl. 4.

The use of planting material infested with *Meloidogyne hapla* results in later cropping, reduced plant size and lower yield. Mean berry size is not reduced. Treatment of nematode-infested runners in hot water at 47° C. for 6, 10 and 14 min. controls the nematode but delays fruiting and does not increase overall yields. The use of dips containing chlorophenyl mercury chloroglucine, phenyl mercury dinaphthylmethane disulphonate, phenyl mercury salicylate or mercuric chloride on nematode-infested runners prior to planting controls nematodes but subsequent plant growth is unsatisfactory. Vigorous runners relatively free of nematodes can be produced in infested fields by allowing rooting to proceed in a 6-in. mulch of sawdust spread between the parent rows. [From author's summary.]

2252. SHIMOKAWA, M., AND USIYAMA, K.
On black root rot in strawberry caused by a nematode, *Pratylenchus* sp. [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 54-9, bibl. 16, illus.

Effective control was obtained by methyl bromide (2 c.c./30 sq. cm.) and Vapam (5–8 c.c./30 sq. cm.). Nemafume, Nemagon and chloropicrin were less effective.

2253. MEAGHER, J. W.
Root-knot nematode of the grape vine. Control in rooted stocks by hot water treatment.
J. Agric. Vict., 1960, **58**: 419-23, 445, bibl. 1, illus.

When sultana stocks, heavily infested with *Meloidogyne javanica*, were submitted to 8 temperature-time combinations by complete immersion in constant temperature water baths for various lengths of time and immediately plunged into cold water at 70° F., complete eradication of the nematodes was obtained in each case. Treatment at 125° F. for 5 min. appeared to be the most suitable. Treatment in dibromo-chloropropane nematicide dip did not give effective control and reduced vine vigour.—Plant Res. Lab., Burnley.

Mites.

(*See also* 1825, 1826, 1828, 2178, 2265, 2286, 2291, 2305, 3565, 3591, 3608.)

2254. (Dicker, G. H. L., and Muir, R. C.)
Current research on control of fruit pests.
Pest Technol., 1960, **3**: 49-50.

Work on the control of red spider mite populations is discussed. The black-kneed capsid (*Blepharidopterus angulatus*) appears to be the main mite predator. On untreated control plots the predator population remained constant from 1957 to 1959 and was always adequate to control the mite.—E. Malling Res. Stat., Kent.

2255. Collyer, E., and Kirby, A. H. M.
Contrasting influence of certain fungicides on orchard fauna in south-east England.
Reprint from *Proc. 4th int. Congr. Crop Prot., Hamburg, 1957*, 1959, Vol. **1**, pp. 949-51, bibl. 12.

Trials over a period of years showed that where lime-sulphur is used as a pre-blossom spray populations of Typhlodromid mites will always be low in May and early June, when they are likely to be of most use as predators of *Metatetranychus ulmi*. [See also *H.A.*, 29: 1285.]—E. Malling Res. Stat., Kent.

2256. Pielou, D. P.
The effect of DDT on oviposition, and on behavior, in the European red mite, *Panonychus ulmi* (Koch).
Canad. J. Zool., 1960, **38**: 1147-51, bibl. 14.

On single, whole, isolated apple leaves sprayed with DDT to give mean deposits of 3·1 and 10·6 μg. per sq. cm., the total egg production per female, the length of life, and the daily rate of oviposition were not significantly different from those on unsprayed leaves. In another experiment females placed on isolated leaves one half of which had been sprayed with DDT spent 3·4 times as much time on the unsprayed halves as on the sprayed halves.—Res. Stat., Summerland, B.C.

2257. Parent, B.
European red mite and its control in apple orchards of Quebec.
A.R. pomol. Fruit Growing Soc. Que., 1959, pp. 61-6, bibl. 9.

The life history, causes of outbreaks and nature of the damage done by *Panonychus ulmi* are discussed. Control measures consist of applications of preventive sprays early in the season. Genite 50% e.c. (6 pt./100 gal.), Tedion 50% w.p. (2 lb./100 gal.) and Ovex 50% w.p. (4 lb./100 gal.) are recommended. Where summer sprays are necessary Trithion 25% w.p. (1 lb./100 gal.) and ethion 25% w.p. (1 lb./100 gal.) give effective control.

2258. Post, A.
Het biocoenotisch onderzoek in boomgaarden. **(Biocoenotic studies in orchards.)** [English summary ¾ p.]
Jversl. Proefst. Fruit. Wilhelminadorp, 1959, pp. 62-70, illus.

The orchard at Eversdijk. Since the experiments were started in 1954, populations of *Panonychus ulmi* have increased considerably on plot 2 (soil cultivation, manuring and pruning) as compared with plot 1 (no treatment). On some trees of Bellefleur population densities of *P. ulmi* were related to leaf contents of N; leaf N increased in the unsprayed, manured plot, and there was a corresponding increase in mite density. Mite populations in sprayed plots increased after a DDT spray for caterpillar control. The response of *Bryobia rubrioculus* to orchard management practices was not conclusive, but random sampling is not recommended as populations are denser on the inside than on the outside of the tree. Green apple and woolly aphids increased on manured, pruned plots. *Kuenen's Hof.* Similar trends were observed in this orchard concerning mite populations. On non-manured, unpruned plots mites and insects did not occur on the leaves, and infection by scab and mildew was less severe than on manured, pruned plots. *Small-scale studies.* One-year-old potted Boskoop trees with equal mite populations were placed in a neglected and in a well-kept orchard; populations decreased in the neglected orchard and increased considerably in the well-kept orchard. The combination of spraying, soil cultivation, manuring and pruning increased the thickness of the leaves, the palisade layer and the epidermal layers; spraying only had no effect on leaf morphology. The combination of soil cultivation, manuring and pruning, without spraying, did not affect the leaf epidermal layers.

2259. van de Vrie, M.
Waarnemingen over het optreden van resistentie tegen bestrijdingsmiddelen bij de fruitspintmijt *Metatetranychus ulmi* Koch. **(Observations on the development of resistance to acaricides in the fruit tree red spider mite.)** [English summary ⅔ p.]
Meded. LandbHogesch. Gent., 1959, **24**: 986-93, bibl. 8, reprinted as *Meded. Inst. PlZiekt. Onderz. Wageningen* **223**.

Strains of the fruit tree red spider mite which were resistant to one of the organic phosphoric esters were also resistant to most other materials of the same group. Gusathion, however, did control these resistant strains but higher concentrations were needed than for non-resistant mites. Resistance to ovi-larvicides has now also appeared. All mites, including those with both types of resistance, were controlled by Kelthane. These studies show the occurrence of "group resistance" in mites, and at the moment the only method of control seems to be a frequent changing from one group of acaricides to another.—Proefst. Fruit., Wilhelminadorp.

2260. VAN DE VRIE, M.
Het acarologisch onderzoek. **(Acarological studies.)** [English summary ½ p.]
Jversl. Proefst. Fruit. Wilhelminadorp, 1959, pp. 51-62, illus.

Red spider mite. In an experiment with normal and modified spray programmes, both gave satisfactory control of mites during the summer. Chlorocide was more effective at 0·25% than at 0·1%. Karathane applied for control of powdery mildew inhibited the development of mites. Observations on predators suggested that these do not regulate mite populations. In a preliminary laboratory experiment dinitrophenyl thiocyanate and Karathane killed all predacious mites; captan and TMTD were not so harmful. Field studies have shown that in 50% of the commercial orchards red spider has built up resistance to organic phosphate materials, and in some cases control was not obtained with ovi-larvicides. Parathion-resistant mites were controlled by Guthion, Kelthane and MC 47. *Black currant gall mite.* Mite populations increased considerably about mid-August, and it was then that the first symptoms of big bud appeared. Four applications of 0·1% endrin or 0·3% thiodan during mite migration gave satisfactory control. *Strawberry mite.* Transfer experiments, which have shown that the *Tarsonemus* species on strawberry is not the same as that on cyclamen, were confirmed by observations on morphology. Control was poor with spring applications of 0·2% endrin, 0·25% Kelthane or 0·3% thiodan.

2261. THILL, H.
Folidol oil for controlling red spider mite.
Höfchen Briefe, 1960, **13**: 137-9.

Over 90% mortality of winter eggs on plum trees was obtained with DNBP liquid (0·75%) and folidol oil (0·5%), whereas with DNOC tar oil (2%) mortality was never more than 30%.

2262. COLLINGWOOD, C. A., VERNON, J. D. R., AND LEGOWSKI, T. J.
Spraying trials against black currant gall mite.
Plant Path., 1960, **9**: 135-43, bibl. 8.

Continuing previous work [see *H.A.*, 30: 5173], sprays of 0·04% endrin, 0·05% thiodan and 0·05% fluoroacetamide, all with 0·02% dioctyl sodium sulphosuccinate added, and 2% lime sulphur were compared. Assessment was by gall counts in the autumn following treatment. Endrin was the most effective, giving a 65% reduction, followed by fluoroacetamide with a 43% reduction. Endrin had no deleterious effects on bees and was considered the most useful material for nursery beds and non-fruiting plantations, both for control of the gall mite and of other pests, with the exception of red spider mite. It also gave better results than the other sprays when restricted to pre-blossom applications. Fluoroacetamide was effective as a post-blossom treatment but was ineffective when applied before blossom. When infested shoots were dipped for 10 min. in a 0·1% solution of fluoroacetamide the mites within the galls were killed; it might thus prove suitable as a dip for cutting material.—N.A.A.S., Bristol and Cambridge.

2263. KONLECHNER, H., AND MAYER, N.
Versuche mit neuen Winterspritzmitteln zur Bekämpfung der Blattgallmilbe. **(Experiments with new winter washes for the control of *Eriophyes vitis*.)**
Mitt. Klosterneuburg. Ser. A., 1959, **9**: 91-5, bibl. 4, illus.

An application in April of Hivertox or diazinon-oil achieved 80–95% control of the mite, but towards the end of August incidence of the pest on treated vines rose to approximately 40% of that on the controls; at that time the mite population was concentrated on the topmost leaves and shoots.

Insect pests.

(*See also* 1828, 2178, 2179, 2305, 2315, 3591, 3592, 3608.)

2264. DOWDY, A. C.
Fruit insects of Michigan.
Ext. Bull. Mich. St. Univ. **372**, 1960, pp. 40, illus.

Including control of pome, stone and soft fruit insects.

2265. BENGSTON, M.
How to control major pests of apples and pears in the granite belt.
Qd agric. J., 1960, **86**: 102-7, illus.

Life histories and control of codling moth, light brown apple moth, mites, woolly aphids, fruit fly (*Strumeta tryoni*) and San José scale.

2266. MEYER, R. H.
New insecticides used in peach pest control in Illinois, 1959.
Trans. Ill. St. hort. Soc. 1959, 1960, **93**: 129-33.

Sevin gave good control of tarnished plant bugs (*Lygus lineolaris*) throughout the entire season and also controlled stink bugs. No fruit thinning effect was observed in these trials. Guthion was also valuable as a post-blossom spray; it controlled a wide range of peach pests, including tree borers if special attention was given to good coverage of the trunks.

2267. (UNION CARBIDE CHEMICALS CO.)
Sevin can now be used on filberts.
West. Fruit Gr, 1960, **14**(8): 31.

Sevin 10% dust, 40–50 lb./acre, applied once early in the season will control filbert aphids and leaf rollers, and applications in late June or early July and again 3–4 weeks later will control filbertworms.

2268. WESTIGARD, P. H., AND MADSEN, H. F.
Principal damage of green apple aphid.
Calif. Agric., 1960, **14**(11): 14.

Honeydew contamination of the fruit. Damaging populations are best assessed by counts on older foliage.

2269. EVENHUIS, H. H.
Cnemodon vitripennis (Meig.) als roofvijand van de appelbloedluis, *Eriosoma lanigerum* (Hausm.) (Dipt.; Hemipt.). **(*Cnemodon vitripennis*, a predator of the woolly aphid.)** [English summary ½ p.]
Ent. Ber., 1959, **19**: 238-40, bibl. 7, reprinted as *Meded. Inst. PlZiekt. Onderz. Wageningen* **222**.

2270. SCHLINGER, E. I., HAGEN, K. S., AND VAN DEN BOSCH, R.
Imported French parasite of walnut aphid established in California.
Calif. Agric., 1960, **14**(11): 3-4, illus.

Trioxys pallidus established locally as a parasite of *Chromaphis juglandicola*.

2271. (NEW ZEALAND DEPARTMENT OF AGRICULTURE, HORTICULTURE DIVISION.)
Raspberry aphis.
Orchard. N.Z., 1960, **33**: 160.

Tar-distillate sprays (1 : 40) applied in mid-July and early August gave good control of the overwintering egg stage of *Aphis idaei*.

2272. MASUTTI, L.
L' *Otiorrhynchus rugosostriatus*, nuovo pericolo per le colture di fragole. **(*Otiorrhynchus rugosostriatus*, a new menace to strawberry crops.)**
Progr. agric., Bologna, 1960, **6**: 961-5, illus.

The application of Gammexane, chlordane and allied insecticides to strawberry beds after harvesting, as practised in Switzerland for control of the weevil larvae, was ineffective in Italy, where metamorphosis occurs during fruit ripening. Good control of the adults has been achieved by 3 fortnightly treatments, after harvesting, with 0·7% lead arsenate, but it is essential for satisfactory results that all the strawberry crops in each area should be treated simultaneously.—Ist. Ent. agrar., Univ. Padua.

2273. AMOS, J. M.
The periodical cicada: 17-year locust to hit.
Circ. Va poly. Inst. agric. Ext. Serv. **862**, 1960, pp. 7, illus.

Control of this orchard pest [*Magicicada septendecim*] by Sevin, Systox or TEPP.

2274. MACHADO CAZORLA, E.
Estudio de la mosca de la fruta y métodos para su control en el valle de Huánuco. **(A study of the fruit fly and methods of controlling it in the Huánuco valley [Peru].)**
Agronomia, Lima, 1960, **27**: 144-52, bibl. 13, illus.

For biological control of *Ceratitis capitata* and *Anastrepha striata*, the parasitic wasps *Opius trinidadensis* and *Pseudocoila carvalhoi* are recommended. Cultural, chemical and legislative measures are outlined.

2275. GLASS, E. H.
Apple maggot fly emergence in western New York.
Bull. N.Y. St. agric. Exp. Stat. **789**, 1960, pp. 29, bibl. 6, illus.

Emergence, recorded during 1951-56, lasted from mid-June to early September, reaching a peak during the last 3 weeks in July and the first week in August. Earliest emergence came from maggots produced in early maturing varieties. Control is obtained by maintaining a film of toxic insecticide on the trees over the middle 6–8 weeks of the emergence period.

2276. JONES, S. C.
Cherry fruit fly control.
West. Fruit Gr, 1960, **14**(6): 41, illus.

Effective control was obtained with diazinon 4% dust at 50 lb./acre and diazinon 25% w.p. at 1 and 2 lb./100 gal. Results of bioassays showed that, when flies were exposed to foliage which had been sprayed 2 days previously, 100% fly mortality was obtained in 24 hours, and with foliage sprayed 13 days previously, 100% fly mortality was obtained in 40 hours. Malathion 4% dust, methoxychlor 5% dust, lead arsenate, Perthane, Sevin and parathion are also recommended.—Ore. St. Coll., Corvallis.

2277. NUCIFORA, A.
Azione adulticida residua del Rogor nella lotta contro la mosca della frutta (*Ceratitis capitata* Wied.). **(Residual effect of Rogor on adult Mediterranean fruit flies.)** [English summary 6 lines.]
Tecn. agric., 1960, **12**: 171-7, bibl. 6.

In preliminary trials on fruiting peach shoots sprayed 12 hours previously with 0·060% Rogor the material had a distinct residual effect, 100% of the test flies being dead 18 hours after exposure.

In subsequent tests in which flies were introduced from 1 to 20 days after the spray application there was 100% mortality after 8–9 days when the flies were introduced 20 days after treatment. Finally, even when treated shoots were sprayed with water for 90 minutes in the laboratory to simulate heavy rain, flies introduced 14 days after Rogor treatment were all dead 8 days later.—Ist. Ent. agrar., Univ. Catania.

2278. Nucifora, A.
Effetti positivi dell'insacchettamento operato su pesche Elberta contro l'infestazione della mosca della frutta (*Ceratitis capitata* Wied.). **(The favourable effects of enclosing Elberta peaches in bags to prevent Mediterranean fruit fly infestation.)**
Tecn. agric., 1960, **12**: 448-53, illus.

Enclosing peaches, 2-3 weeks before harvesting, in translucent, moisture-permeable paper bags was much more effective against fruit flies than spraying with 0·06% Rogor, and the covered fruits were significantly larger than those that were sprayed.—Ist. Ent. agrar., Univ. Catania.

2279. Anon.
Nuovi mezzi di lotta per proteggere le pesche dalla mosca della frutta. **(New measures for the protection of peaches from the Mediterranean fruit fly.)**
Tecn. agric., 1960, **12**: 180-3, illus.

Complete control in a severely infested district was obtained with 20% Rogor applied twice to Elberta peaches at 50 g. active ingredient per 100 l. water, the first application being made a month before picking and the second 10 days later. The pulp of mature fruit contained only 0·7 p.p.m. active ingredient. A single application about 3 weeks before picking also gave satisfactory results.—Ist. Ent. agrar., Univ. Catania.

2280. Congdon, N. B.
Control of mealy bug.
Orchard. N.Z., 1960, **33**: 310-13, illus.

Three trials were carried out. In the first [see *H.A.*, 30: 508] Rogor 40 at 16 oz./100 gal., diazinon 20% emulsion at 20 oz./100 gal. and parathion 31% at 15 oz./100 gal. were applied to pear trees, all plus Triton B spreader at 2 oz./100 gal. All gave good control of mealy bugs, but with Rogor there was less fruit dropping during harvest and better leaf-roller control. In the second trial the Turbo-Mist machine gave better control of mealy bugs on pears than the Bes Blo airblast. In the third a comparison was made of different dilution rates of diazinon, parathion and Rogor 40 in relation to the interval between sprayings on Jonathan apples. Little difference was found in the effectiveness of the rates tested, and with good coverage mealy bugs could be controlled with monthly sprayings.

2281. Dickinson, T. A.
Light attracts and whirling blades kill.
Grower, 1960, **54**: 1092.

At night a Californian apple grower switches on an ultra-violet light which attracts moths into the whirling of 4 rotor blades. These are powered by an electric motor turning at 1,000 r.p.m., and each rotor blade is made of two heavy strands of wire. The grower claims that the device is more effective than insecticides.

2282. Stein, W.
Versuche zur biologischen Bekämpfung des Apfelwicklers (*Carpocapsa pomonella* (L.)) durch Eiparasiten der Gattung *Trichogramma*. **(Studies on the biological control of codling moth with *Trichogramma* egg-parasites.)** [English summary $\frac{3}{4}$ p.]
Reprint from *Entomophaga*, 1960, **5**: 237-59, bibl. 25, illus.

Parasites were reared under constant optimal conditions (27° C., 80% R.H., in one host *Sitotroga cerealella*) and under changing conditions (10 hours at 16° C., 80% R.H. and darkness, and 14 hours at 26° C., 60% R.H. in the light, in another host *Galleria mellonella*). Those reared under changing conditions were much more efficient in controlling codling moth. Best results were achieved when all the parasites were released at the beginning of the flight period of the codling moth. The possibility of further improvements in the use of *Trichogramma* is discussed.—Inst. biol. Schädlingsbekämpf., Darmstadt.

2283. May, A. W. S., and Bengston, M.
Studies on codling moth control in the granite belt.
Qd J. agric. Sci., 1959, **16**: 355-63, bibl. 14.

The details are given of 6 trials on the control of *Enarmonia pomonella* in apple orchards. The materials used were DDT, DDD (TDE), diazinon, dieldrin, endrin, malathion, methoxychlor and parathion. The results illustrate the variation in codling moth populations between orchards and seasons. Under the conditions of these trials none of the newer materials tested gave better results than DDT. [From authors' summary.]

2284. Kozlova, E. N., Kulikov, A. I., and Kurlina, I. P.
A new insecticide, Sevin. [Russian.]
Vestn. s.-h. Nauki, 1960, **5**(7): 131-4, bibl. 15.

The literature on Sevin is reviewed and some results of control trials in the field are given. Applications in July of an 0·7% suspension of 30% w.p. against the second generation of codling moth reduced both fruit drop and larval infestation by 80%.

2285. Matvievskij, A. S., and Serebrjanaja, S. G.
New preparations for the control of the codling moth. [Russian.]
Sadovodstvo, 1960, No. 6, pp. 33-4.

Tests were carried out on apples with DDD (dichloro-diphenyl-dichloroethane) and Perthane (diethyl-diphenyl-dichloromethylmethane), using 3 sprays between 12 June and 25 July. A 30% preparation of DDD at 0·7% and 1·5% concentrations, and a 15% preparation of Perthane at 4% concentration proved highly effective. Residues at harvest of both compounds were within the permissible limits.

2286. Maelzer, D. A., and Lohmeyer, V. K.
Insecticides and the resistance problem in apple and pear orchards in South Australia.
Tech. Bull. Dep. Agric. S. Aust. **30**, 1960, pp. 8, bibl. 5.

The alternate use of chemicals with different modes of action is recommended for delaying the development of resistant species. Alternate spray programmes are suggested for the control of codling moth (*Enarmonia pomonella*), light-brown apple moth (*Epiphyas postvittana*) and two-spotted spider mite (*Tetranychus telarius*).

2287. Krämer, K.
Tests on the control of apple fruit moth (*Argyresthia conjugella* Zell.).
Höfchen-Briefe, 1960, **13**: 185-96, bibl. 1, illus.

Applications of 0·035% E605 forte to apple trees beginning 4 to 5 weeks after the moths emerged, or alternatively to mountain ash (*Sorbus aucuparia*) 4 to 5 weeks after full bloom, have given good control of the apple fruit moth and also of the codling moth. Phenological observations on *Sorbus aucuparia* and on the emergence of *Argyresthia conjugella* have shown that emergence of the adult moths coincided with full bloom of mountain ash. —Tech. Univ., Hanover.

2288. Küthe, K.
Experience on the use of Folidol oil for treating pome fruit, especially against winter moth (*Cheimatobia brumata* L.).
Höfchen-Briefe, 1960, **13**: 177-84, bibl. 6.

When applied from February to early April a spray of 0·5% Folidol oil gave control of the moth on apple equal to or better than DNOC, and reduced the moth infestation in May from 79% on the controls to 14% on the treated trees.—Crop Prot. Off., Frankfurt/Main.

2289. Günther, S.
Über einen Bekämpfungsversuch mit *Bacillus thuringiensis* Berliner gegen *Hyponomeuta malinella* Zell. **(Trials on the control of *Hyponomeuta malinella* by *Bacillus thuringiensis*.)** [English summary 5 lines.]
Z. PflKrankh., 1960, **67**: 475-8, bibl. 3.

Suspensions of 9×10^7 and $4{\cdot}5 \times 10^7$ spores/ml. of *Bacillus thuringiensis* sprayed in an apple orchard gave 100% mortality of the small ermine moth (*Hyponomeuta malinella*). Some rain which fell 3 days after application probably increased the insecticidal action.—Inst. Forstwiss., Tharandt.

2290. Hey, G. L., and Bryant, J. H.
Rhothane and Sevin control tortrix.
Spring and summer controls for tortrix.
Grower, 1960, **54**: 1134-6, and 1186-9, illus.

The biology of 6 tortrix species damaging to apple fruits is discussed. Trials on the control of the overwintering larvae (chiefly *Archips podana*) by pre-blossom spraying showed that all 4 spray schedules tried (including Rhothane and Sevin) reduced the percentage of infected blossom trusses. In summer spraying trials Rhothane was more effective than Sevin, but both gave better control of tortrix than DDT; slightly better results were obtained by spraying at fortnightly intervals than at 3-week intervals. Recommendations are also given for the control of surface-eating tortrix caterpillars and of the summer fruit tortrix (*Adoxophyes orana*) on apple.—Murphy Chem. Co. Ltd., Wheathampstead.

2291. de Jong, D. J.
Het entomologisch onderzoek. **(Entomological studies.)** [English summary ½ p.]
Jversl. Proefst. Fruit. Wilhelminadorp, 1959, pp. 46-50.

A normal and a modified (i.e., less harmful to beneficial insects) spray schedule for control of mites and lepidoptera were compared and both gave satisfactory control of these pests. The summer fruit tortrix (*Adoxophyes reticulana*) was the only pest to cause damage, and was more effectively controlled by Phosdrin than by Perthane. In the orchard given a modified spray schedule the number of tortrix species and the percentage of caterpillars parasitized were both higher than in the orchard with the normal spray programme. In a preliminary trial caterpillars of *Adoxophyes reticulana* were killed after infection with *Bacillus thuringiensis*. Ryania was effective for codling moth control.

2292. Basson, S. G., and Myburgh, A. C.
Leaf rollers injurious to the fruits of apples and pears.
Dec. Fruit Gr, 1960, **10**: 152-4, illus.

The damage recently caused by the larvae of *Tortrix capensana* and *Epichorista ionephala* is described. DDT used for codling moth control has almost eliminated the parasites which previously controlled these leaf rollers, but a number of alternative insecticides which are toxic to the leaf rollers are being tested.—W.P. Fruit Res. Stat., Stellenbosch.

2293. Markelova, E. M.
The hawthorn tortrix (*Cacoecia crataegana* Hb.), a pest of fruit crops. [Russian.]
Ent. Obozrenie, 1959 (issued 1960), **38**: 673-8, illus., from *Biol. Abstr., Sect. E*, 1960, **35**, Abstr. 61,101.

The biology of the pest on apples is described. Application of machine oil emulsion (8%) reduced the hatch by only 34·3%; carbolineum (6–10%) was even less effective.

2294. ANON.
La *Zeuzera pyrina* L. (**The leopard moth, *Zeuzera pyrina*.**)
Tecn. agric., 1959, **11**: 640-3, illus.

The pest seriously damages pear, apple and olive trees in Italy, as well as attacking cherry, walnut and hazel nut trees. Control measures involving stabbing the larvae in their tunnels in the branches with sharp wire, or fumigating the tunnels with volatile insecticides, are tedious but effective. The recommendation for preventive treatment is at least 2 applications of DDT emulsion at 150 g. of active material per 100 l. of water, in June. This is particularly necessary in nurseries.—Univ. Catania.

2295. WISHART, R. L.
Oriental fruit moth.
J. Agric. S. Aust., 1960, **64**: 26-30, 41, illus.

Control of *Cydia molesta* on peaches by monthly spraying with 0·05% Gusathion, starting in early October.

2296. GALLEGO M., F. L.
Las brocas o pasadores de los brevos (*Azochis gripusalis* W.K. fam. Pyroustidae). (**Fig borers, *Azochis gripusalis*.**)
Rev. Fac. nac. Agron. Colombia, 1960, **20**(54): 44-6, bibl. 1.

In Brazil the larvae of this moth are controlled by spraying the trees at 10-day intervals with 300 mg. of lead arsenate plus 600 mg. of freshly slaked lime to each 100 l. of water. The recommendation for Colombia is 1 lb. of 50% DDT in 150–200 l. of water as a supplement to cutting out and burning twigs into which the larvae have penetrated.

2297. ŠEDIVÝ, J., AND KODYS, F.
K bionomii a škodlivosti nesytky rybizové (*Aegeria tipuliformis* Clerck). (**The bionomics of, and damage caused by the red currant stem borer.**)
Zoologické listy, 1959, **8**(22): 97-104, from abstr. in *Z. PflKrankh.*, 1960, **67**: 698.

Spraying with parathion 10–14 days after the appearance of the first moth gave 90% control.

2298. CHABOUSSOU, F., AND CARLES, J. P.
Essais de traitements chimiques contre la première génération de la Cochylis et les première et deuxième générations de l'Eudémis dans le Bordelais en 1959. (**Trials on the chemical control of the first generation of *Cochylis* and the first and second generations of *Eudemis* in the Bordeaux district in 1959.**)
Phytiat.-Phytopharm., Paris, 1960, **9**: 37-45.

Phosdrine, dimethyl-methyl-mercapto-methyl-phenyl thiophosphate and Sevin were effective when the eggs of the first generation of these two vine pests had all hatched, or when those of the second generation of *Eudemis* were 80% hatched.—I.N.R.A., Stat. Zool. agric. Sud-Ouest, Pont-de-la-Maye.

2299. ANON.
I principali diaspini dannosi ai fruttiferi. (**The chief diaspids injurious to fruit trees.**)
Progr. agric., Bologna, 1960, **6**: 1315-16, illus.

Diaspis leperii (grey scale) on pear trees is controlled by applying 1–1·5% white oils, with or without parathion, from mid-May to early June. San José scale (*Aspidiotus perniciosus*) can be controlled by winter treatment of apple and pear trees with 25–30% calcium polysulphide (32° Bé). Barium polysulphide can be used at 7–8% on these and at 6–7% on peach, apricot, plum and cherry trees. White oils are used at 4–5% alone in winter, or at 1·5–2% mixed with parathion at 0·05–0·07% at bud burst. Anthracene oils, preferably those miscible with polysulphides, are applied in winter at 5–7%. Yellow oils at 3–5% are used before the buds begin swelling.

2300. EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANISATION. (E.P.P.O.).
San José scale in Europe and the Mediterranean basin in 1959. [French and English.]
[*Publ.*] *E.P.P.O.*, 1960, pp. 10.

Including incidence of the pest in various countries, chemical and biological control including the release of the parasite *Prospaltella perniciosi* in France and Russia, and interceptions of San José scale on imported produce during 1959.

2301. HARROW, K. M.
Control of San José scale.
Orchard. N.Z., 1960, **33**: 133-7.

On apples strong lime sulphur (1 in 10) followed by a spray of superior oil (3%) or superior oil (3%) plus parathion (31%) gave the best control among the 10 dormant and green tip sprays tested. Seven applications of Sevin (50% w.p., 1 lb./100 gal.) at fortnightly intervals gave 100% control during the summer months.—D.S.I.R., Auckland, N.Z.

2302. BÉNASSY, C., BIANCHI, H., AND MILAIRE, H.
Observations sur la répercussion des traitements préconisés en vergers, sur *Prospaltella perniciosi* Tower, parasite spécifique de *Quadraspidiotus perniciosus* Comst. (**Observations on the repercussions on *Prospaltella perniciosi*, specific parasite of *Quadraspidiotus perniciosus*, of treatments recommended in orchards.**)
Phytiat.-Phytopharm., Paris, 1960, **9**: 29-36, bibl. 4, illus.

Winter treatment of fruit trees with petroleum oils plus DNC resulted in the total mortality of *P. perniciosi*, but summer applications of various fungicides had no serious effect. The predator was less susceptible than its host to summer application of white oil, but more susceptible than its host to white oil with DDT or parathion added.—I.N.R.A. Stat. Lutte biol., Antibes.

2303. MARTELLI, G. M.
La monosteira del mandorlo e i moderni mezzi di lotta. (**Modern methods of controlling *Monosteira unicostata* on almond.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 172-4, illus.

Various methods of control are discussed. In summer good residual control of the newly hatched larvae is obtained by spraying with a chlorophospho-organic mixture containing 10% parathion, 40% DDT and 50% of an emulsifying agent at 500 g. per hl. [see also *H.A.*, 28: 1276 and 3562e]. Winter control trials are in progress.—Osserv. Malat. Piante, Bari.

Chemicals and their application.

(*See also* 1818, 1837-1839, 1842-1844, 1974, 2159, 2225, 2284, 3570.)

2304. STEINER, H.
Über die Eignung verschiedener Pflanzenschutz-Mittel für eine schonende Spritzfolge im Obstbau. (**The use of various plant protection materials for selective control in fruit growing.**) [English summary 9 lines.]
Z. angew. Ent., 1960, **47**: 79-84, bibl. 10.

The effects of several insecticides, acaricides and fungicides on apple tree fauna were studied. The author discusses the suitability of plant protection materials for use in a modified spray programme for orchards, which takes account of biological pest control.

2305. KRIEGLER, P. J.
Winter sprays for apple and pear trees.
Dec. Fruit Gr, 1960, **10**: 150-1, illus.

Notes on the use of winter oil, DNC and dinoseb compounds and lime sulphur to counteract delayed foliation and to control scale, woolly aphid and the eggs of bryobia mite.

2306. CASARINI, B., ERCOLANI, G. L., AND GOVI, G.
Influenza degli anticrittogamici sulla fioritura del melo. (**The effect of fungicides on the flowering of apple trees.**)
Progr. agric., Bologna, 1960, **6**: 1177-87, illus.

The fungicides used throughout the first test year for scab control on 3 apple varieties were 0·15% phenyl mercuric acetate, 0·25% captan, 0·37% copper-calcium oxychloride, 0·3% copper oxychloride, and thiram, zineb and ziram each at 0·25%. In the following year only zineb was used up to flowering time. The dithiocarbamates and captan had favourable effects on flowering and the other fungicides unfavourable effects, particularly the mercurial product on the varieties Stark Delicious and Starking, apparently prolonging the vegetative growth phase at the expense of flower production. The beneficial effects of zineb and captan were more pronounced in the year of application, whereas those of ziram and thiram were more marked in the following year. Reduction of flowering by the copper fungicides was particularly evident in Golden Delicious. [For effects on fruit set see *H.A.*, 30: 5138.]—Ist. Patol. veg., Univ. Bologna.

2307. ARMAN, P., AND WAIN, R. L.
Studies upon the copper fungicides. XI. Absorption of soluble copper in relation to stage of leaf growth and to leaf injury.
Ann. appl. Biol., 1960, **48**: 392-8, bibl. 9.

The ability of young apple leaves to absorb copper was found to be relatively high, lessening as the leaves grew more mature, rising again to a maximum in July or August, and falling again as the leaves approached senescence. It was observed in the field that apple leaves are often more susceptible to copper spray damage in the autumn, at a time when absorption is low. Leaf injuries normally present in the autumn were found to increase the excretion of copper-dissolving substances and also to increase slightly the rate of absorption of the soluble copper. [For Part X, see *H.A.*, 29: 311b.]—Wye Coll., Kent.

2308. SHIGETA, T., AND WATANABE, T.
The effect of bordeaux and other fungicides on the prevention of russet (physiological russeting) on Asahi pears. [Japanese, with English summary $\frac{1}{3}$ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 21-4, illus.

The highest proportion of russeted pears occurred among fruits with the calyx intact, followed by those with the calyx removed by hand, and the lowest proportion among fruit naturally without a calyx. Calyx formation took place mainly when pollination occurred early during the blossoming period. When pollination took place later, non-calyx fruits were formed. Bordeaux mixture resulted in less russeting than the other fungicides tested.

2309. BEYER, W. W.
The effect of fungicide and insecticide spray treatment on the physico-chemical properties of fresh and processed Montmorency cherries.
Diss. Abstr., 1960, **21**: 584, being *L.C. Card No. Mic.* 60-3172 of 118 pp.

Detailed observations were made of the effect on fruit quality (size, colour, flavour, acidity and contents of total and soluble solids) of the following spray materials: bordeaux, ferbam, nabam, Cyprex, Actidione, lead arsenate, parathion and methoxychlor. The insecticides had less effect on quality than the fungicides.—Univ. Wis., Madison.

2310. Bosian, G., Paetzholdt, M., and Ensgraber, A.
Über die Beeinflussung der CO_2-Assimilation der Rebe durch Pflanzenschutzmittel. (**The effect of plant protection chemicals on the photosynthesis of the vine.**)
Reprint from *Proc. 4th int. Congr. Crop Prot., Hamburg, 1957*, 1960, Vol. **2**, pp. 1517-22.

The copper-free fungicides dithane and Lutiram promoted photosynthesis in vines; Orthocide 50 proved neutral. The other chemicals tested, OB21, E605, Cosan, Gesarol, Metasystox and bordeaux mixture, reduced the rate of photosynthesis. The degree to which photosynthesis was affected in each case is shown graphically.—Neustadt a. d. Weinstrasse.

2311. Stewart, D. K. R., and Ross, R. G.
Further studies of mercury residues on apple fruit.
Canad. J. Plant Sci., 1960, **40**: 659-65, bibl. 6.

Following single cover sprays of Erad (phenyl mercury acetate) mercury residues in apples declined until early in August and then increased until at harvest they were greater than the initial deposits. The accumulation of mercury in the maturing fruit appeared to be by translocation from other parts of the tree. Mylar film bags were more effective than polythene for protecting fruit from contamination with Erad during and following spraying. [Authors' abstract.—For earlier work see *H.A.*, 30: 3624.]—Canada Dep. Agric., Kentville, N.S.

2312. Frear, D. E. H., Smith, E. C., and Bowery, T. G.
Dodecylguanidine acetate (dodine) residues on apples.
J. agric. Food Chem., 1960, **8**: 465-6, bibl. 1.

The colorimetric estimation method of Steller [see abstr. 1843] was used to analyse 73 samples. Apples receiving no dodine showed an average apparent dodine residue of 0·10 p.p.m. Fifty-six samples sprayed with Cyprex 65-W at rates of from 0·5 to 1·75 lb. per 100 gal. contained residues at harvest of up to 1·29 p.p.m., with an average of 0·28 p.p.m. Residues of 0·2, 0·4 and 0·6 p.p.m. were found 33 days after applying 0·25, 0·50 and 0·75 lb. of 65% dodine w.p.—Pa St. Univ., and N.C. St. Coll.

2313. Skepper, A.
Concentrate spraying of deciduous fruit trees.
Agric. Gaz. N.S.W., 1960, **71**: 296-303, bibl. 1, illus.

For efficient concentrate spraying a specially designed machine is required equipped with either axial flow or centrifugal blowers with the air stream directed at 45° to the vertical. Correct pressure (250–300 lb./sq. in.), nozzle size, rate of travel (1½ m.p.h.) and spray concentration are important. Suggested concentrations for a number of sprays are listed and the use of surfactants is discussed.

2314. Sansavini, S., and di Caro, S.
Gli elicotteri nella difesa anticrittogamica dei frutteti industriali. Una prima esperienza. (**Helicopters in the control of fungal diseases in commercial orchards. A first experiment.**)
Inf. fitopat., 1960, **10**: 324-9, illus.

Trials in Ferrara orchards led to the following conclusions: (1) spraying gave better results than dusting; (2) coverage was better on trees previously wetted by spraying with water (to simulate the typical rainy conditions of spring) than on dry trees; (3) coverage was better on the upper than on the lower parts of the crowns; (4) application at right angles to the rows was more effective than application parallel with the rows; (5) 200 l. per ha. gave better results than 100 l. It was concluded that the use of helicopters for the spring treatment of scab would be technically advantageous when it is difficult or impossible, in the time available, to use ground sprayers.

2315. MacCollom, G. B., and Calahan, C. L.
Air dusting for apple pest control in Vermont.
Misc. Publ. Vt agric. Exp. Stat. **13**, 1960, pp. 13, bibl. 10, illus.

The equipment, technique and economics of aerial dusting are discussed. Complete control of primary scab was obtained using a 3X concentrated dust of 9% dichlone plus 12% Guthion at 12–13 lb./acre. Fungicides, which in spray form tend to cause russeting, proved safe as dusts for use on russet-susceptible varieties. An excellent fruit finish and a minimum residue at harvest time were obtained by air-dusting. Full-season control of the entire apple insect and mite complex was achieved using air dusts. Severe insect outbreaks may require 3 dust applications for control compared with 2 sprays. Satisfactory control of curculio, codling moth and apple maggot was obtained by dusting early with 5% DDT and 15% lead arsenate. A late season application of 3% Guthion controlled second-brood red-banded leaf roller and late-emerging apple maggot.

VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE.

General.

(*See also* 1685, 1686, 1692, 1693, 1710, 1807, 1827, 1828, 1832, 1839, 1888, 2031, 2048, 2052, 3558, 3569, 3576-3578, 3588, 3596, 3597, 3599, 3607, 3608, 3610.)

2316. van Wely, A. J. M.
De groenteteelt in tabel en kaart. **(Vegetable growing [in Holland] in tables and maps.)**
Tuinbouwvoorlichting **8**, 1959, pp. 106, numerous maps.

Many statistical data presented to show what, where and how much is grown commercially of each vegetable.

2317. Oebker, N. F., Britton, M. P., and Luckmann, W. H.
Illinois vegetable garden guide.
Circ. Univ. Ill. agric. Ext. Serv. **816**, 1960, pp. 56, illus.

All aspects of vegetable growing on a garden scale.

2318. National Institute of Agricultural Botany, Cambridge.
Fortieth Report and Accounts, 1959, 1960, pp. 63.

Including reports on variety trials with brussels sprouts, winter and summer cauliflowers, early and maincrop carrots, onions, runner beans, spring cabbages and vining peas.

2319. University of Wisconsin, Department of Horticulture.
Vegetable varieties for Wisconsin 1960.
Circ. Wis. Coll. Agric. **536**, revised 1960, pp. 4.

2320. Harrington, J. F.
Storage of vegetable seed.
Calif. Agric., 1960, **14**(10): 16.

Vegetable seeds dried at harvest to 4–6% moisture content and stored in moisture-proof containers, preferably tin or aluminium cans, maintained high germination and vigour for more than 3 years. The seed should be dried at temperatures not exceeding 110° F., and stored at as low a temperature as possible. [See also *H.A.*, 29: 3203n and 30: 4668.] —Univ. Calif., Davis.

2321. Harrington, J. F.
Germination of seeds from carrot, lettuce, and pepper plants grown under severe nutrient deficiencies.
Hilgardia, 1960, **30**: 219-35, bibl. 11.

Plants of carrot, lettuce and pepper were grown in sand cultures receiving either a complete nutrient solution or one deficient in N, P, K or Ca. An effort was made to produce severe deficiency, but not to a point at which no seeds would be produced. Plants showed various deficiency symptoms, including necrosis of the growing tips, with Ca deficiency, and necrotic spots along the leaf margins in the case of K deficiency. Seed yields were always depressed by low N, P, K or Ca treatments. Percentage of normal seeds was depressed by low N, K or Ca, but not by low P. At harvest, seeds from low N and P treatments usually showed the same germination as that of seeds receiving complete solution. However, K deficiency resulted in lower germination in some experiments, as did Ca deficiency in carrots and peppers. In storage, seeds from low K and Ca treatments declined in germination faster than did seeds from the complete-solution treatments. [Author's summary.]—Univ. Calif., Davis.

2322. Cásseres, E. H., Richardson, R. W., Jr., and Garatuza, M.
The vegetable seed production area of north-west Mexico.
Proc. Carib. Reg. Amer. Soc. hort. Sci. 1959, 1959, **7**: 10-14, bibl. 3.

Studies on pea growing for seed have shown that the best yields can be expected from sowing 80 kg./ha. of seed in double rows 0·92 cm. apart on the top of ridges. Cantaloupe seeds were successfully extracted on a trial basis by a tomato extractor.

2323. Kuzin, A. M.
The use of pre-sowing irradiation with γ-rays in agriculture. [Russian, with English, German and French summaries 8 lines each.]
Vestn. s.-h. Nauki, 1960, **5**(7): 127-30, bibl. 22.

Work on the gamma irradiation of crop seeds is reviewed, and improvements in earliness and yield under experimental and commercial conditions are recorded. The optimum dosages of γ-rays from Co^{60} were: 300 r for peas and cucumbers, 500 r for turnips, 1,000 r for radishes and tomatoes, 2,000 r for cabbages and 2,500 r for carrots.

2324. Lanckow, J.
Das Praxisaggregat PA 57 und seine Eignung für die Zusatzbelichtung im Treibgemüsebau. **(The lamp unit PA 57 and its suitability for supplementary lighting in forced vegetable growing.)** [Russian and English summaries 12 and 11 lines.]
Arch. Gartenb., 1960, **8**: 403-18, bibl. 11, illus.

PA 53, a unit aggregate of fluorescent tubes, was improved by replacing the sheet iron reflector by a roller blind, which made the unit lighter and therefore more mobile. The new unit is called PA 57 [see *H.A.*, 28: 2513]. Both units had similar effects in accelerating seedling growth, and they increased early and total yields of tomatoes and cucumbers by comparison with plants which received no supplementary lighting during the seedling stage.—Inst. Gartenb., Grossbeeren.

2325. Lanckow, J., and Heissner, A.
Streulichteinfluss bei der Zusatzbelichtung von Gemüsejungpflanzen. (**The effect of scattered light on young vegetable plants exposed to supplementary illumination.**)
Dtsch. Gartenb., 1960, **7**: 268-9, bibl. 2, illus.

Young cucumber, tomato, kohl-rabi and lettuce plants were exposed to supplementary lighting from a mobile PA 57 lamp unit [see preceding abstract] during the night for a period of 8 hours. When the lamp unit was moved on to the next plot, the plants in the first plot received some lateral radiation of scattered light, but it was found that growth proceeded normally and that no protection against scattered light was required.—Inst. Gartenb., Grossbeeren.

2326. Ministry of Agriculture, London.
Soils and manures for vegetables.
Bull. Minist. Agric., Lond. **71**, 3rd edition, 1959, pp. 78.

The second edition of this bulletin appeared as long ago as 1939 under the title "The manuring of vegetable crops". In its third edition the bulletin has been completely rewritten. The information on soils for vegetables has been expanded. New knowledge on mineral nutrients and deficiencies, based on the results of research, is included. The fertilizers and manures available to growers are described in detail. As to the manuring of individual crops the current practices of vegetable growers are discussed in the light of experience of the advisory officers in the vegetable growing areas of Great Britain.

2327. Strijbosch, T.
Bodemgeschiktheidsclassificatie ten behoeve van de groenteteelt onder verwarmd glas. (**A classification of soil suitability for vegetable growing under heated glass.**) [English summary ¼ p.]
Meded. Dir. Tuinb., 1960, **23**: 506-14, bibl. 4, illus.

Types of peat soils in the South Holland district are not considered suitable for glasshouse crops, chiefly because of the high rate of water removal by such cultures. Soils with an organic matter content between 7% and 20% are preferred. [For earlier work, see *H.A.*, 30: 4678].—R.T.C., The Hague.

2328. Vlček, F., and others.
Příspěvek k přípravě kompostů a jejich využití v zelinářství. (**On the preparation of compost and its use in horticulture.**) [Russian and German summaries ⅓ p. each.]
Rostlinná Výroba, 1960, **6**: 535-44, bibl. 10.

Four composts were tried, in which either crop residues, peat, industrial ash or stable manure preponderated. Each was applied at 400 quintals per hectare to onion, cabbage and tomato crops. The best results were obtained with the peat and stable manure composts. Lower yields with ash compost were attributed to its lower nutrient content. It can, however, be used to improve the physical condition of heavy soils.

2329. van Gilst, K. B.
Sunnhennep (*Crotalaria juncea*) as wisselbougewas vir tuinbougronde. (**Sunnhemp as a rotation crop in horticulture.**) [English and French summaries ½ p. each.]
S. Afr. J. agric. Sci., 1960, **3**: 209-29, bibl. 3.

The effects of incorporating sunnhemp as a green manure at its flowering, pod and mature stages on the ammonia and nitrate-N levels of the soil were investigated. From soil analysis and the yields of subsequent crops, including cabbage, it appears that the incorporation of sunnhemp even when mature is not followed by a period of N shortage.

2330. Krummel, N. J., and Castronovo, A.
Ensayos de fertilización en hortalizas. (**Vegetable fertilizer trials.**) [English summary ⅓ p.]
Idia, 1960, No. 151, pp. 1-10, bibl. 2.

The 5 treatments in a 1-year trial were a complete fertilizer at 90 : 180 : 180 kg. N, P, K per hectare, superphosphate at 180 kg. P_2O_5/ha., Chilean nitrate at 90 kg. N/ha., Chilean nitrate plus superphosphate as above and control. With lettuce the only treatment giving a significantly greater mean weight of whole plant than the control was the complete fertilizer. With turnips complete fertilizer, Chilean nitrate and Chilean nitrate plus superphosphate all significantly outyielded the control in mean weight per plant. Broad beans did not respond to any of the treatments.—Inst. Fitotec., Buenos Aires.

2331. Döring, H.
Untersuchungen über die Wirkung verschiedener Phosphatdünger auf Niedermoorboden des Südberliner Raumes. (**The effect of different phosphate fertilizers on fen soils in the region of South Berlin.**) [Russian and English summaries 17 and 14 lines.]
Arch. Gartenb., 1960, **8**: 453-67, bibl. 10, illus.

The object of the experiments described was to study the effect on fen soils of the proprietary phosphate fertilizer Hyperphos, which had proved satisfactory elsewhere. Hyperphos failed in container trials with various vegetables, but in field trials with spinach and celeriac its action was as good as that of non-water-soluble phosphates.—Inst. Gartenb., Grossbeeren.

2332. Gandhi, S. C., and Mehta, B. V.
Studies on boron deficiency and toxicity symptoms in some common crops of Gujarat.
Indian J. agric. Sci., 1959 (issued 1960), **29**: 63-70, bibl. 14.

The B deficiency symptoms of Indian bean (*Dolichos lablab*), tobacco, onion, cluster bean

(*Cyamopsis psoraloides*) and *Pennisetum typhoideum* are described. For normal growth the nutrient solution should contain 0·01 p.p.m. B for Indian bean, onion and cluster bean, and 0·5 p.p.m. for tobacco.—Inst. Agric., Anand, Bombay.

2333. Anon.
Weeds in horticultural crops.
Res. Progr. Rep. west. Weed Control Conf., 1960, pp. 31-8.

Eight reports giving the results of herbicidal treatments in vegetable, ornamental and deciduous and evergreen fruit crops are summarized.—See *Weed Abstr.*, **9**, No. 1406.

2334. Pirttilä, H.
Allyylialkoholi puutarhaviljelysten rikkaruohontorjunta-aineena. (**The use of allyl alcohol for weed control in horticulture.**) [English summary $\frac{1}{3}$ p.]
Maatalous ja Koetoim., 1960, **14**: 219-27, illus.

Allyl alcohol was effective in controlling annual weeds in carrots, beetroot, swedes, radishes, spinach, lettuces and strawberries. A rate of 1 l. per are was satisfactory, and 0·5 l. was sufficient in some cases.—Agric. Res. Centre, Tikkurila.

2335. Orsenigo, J. R.
The performance of amiben and Dinoben granules in weeding several transplant crops on organic soil.
Proc. 13th annu. Mtg south. Weed Conf., 1960, pp. 71-7.

Amiben (granular) at 3–7 lb./acre, amiben (liquid) at 3 lb./acre and Dinoben (granular) at 3–7 lb./acre were applied 1 or 2 days after transplanting broccoli, cabbage, cauliflower, lettuce, tomato, eggplant, pepper and celery. The liquid formulation of amiben was rather more effective than the granular and both were more active than Dinoben. Liquid amiben gave 84% control of grasses and about 60% control of broad-leaved weeds. There was no significant effect on the stand or yield of cabbages, lettuces or tomatoes.—Everglades Exp. Stat., Fla.—From *Weed Abstr.*, **9**, No. 1408.

2336. Fischer, A.
Neue Herbizide zur Unkrautbekämpfung in Rüben- und Gemüsekulturen im Vorauflaufverfahren. (**New herbicides for weed control in beets and vegetables by pre-emergence treatment.**) [English summary 15 lines.]
Z. PflKrankh., 1960, **67**: 577-88, bibl. 15, illus.

See *H.A.*, 30: 3681.

2337. Orsenigo, J. R.
Primary evaluation of pre- and post-emergence applied herbicides in vegetable and field crops, spring, 1959.
Mimeo. Rep. Everglades Exp. Stat., Fla **60-7**, 1959, pp. 32.

The tolerance of 28 crops and of grassy and broad-leaved weeds on organic soils to a very large number of herbicides is shown in 29 tables. In the pre-emergence treatments the best weed control with the least crop damage resulted from applications of liquid or granular CDEC or CDAA, each at 4 lb./acre. In post-emergence treatments several herbicides gave good weed control and carrots appeared to be the most tolerant crop.—From *Weed Abstr.*, **9**, No. 1742.

2338. Guzmán Martínez, E.
Ensayo sobre el uso de herbicidas en los cultivos de zanahoria y chícharo en el Valle de Toluca—México. (**An experiment on the use of herbicides on carrot and pea crops in the Valle de Toluca, Mexico.**)
Proc. Carib. Reg. Amer. Soc. hort. Sci. 1959, 1959, **7**: 1-5.

For another account, see *H.A.*, 31: 768.

2339. Crossan, D. F., Johnson, W. H., and Siegel, M. R.
Vegetable disease control in Delaware in 1958.
Plant Dis. Reptr, 1959, **43**: 732-4.

Tomato: Phaltan was as good as Dithane M-22 and was significantly better than Dyrene for anthracnose control; both Dyrene and Dithane M-22 gave excellent control of grey leaf spot, but control by Phaltan was much poorer. *Capsicum:* both Dithane Z-78 and Manzate gave significantly effective control of ripe-rot (*Colletotrichum capsici*). *Cantaloupe:* Dyrene and Dithane M-22 gave the best control of *Alternaria* leaf spot. *Lima bean:* Dithane M-22 and Dyrene were significantly better against stem anthracnose (*Colletotrichum truncatum*) than Phaltan, Ortho 80W or Tribasic copper sulphate—Univ. Del., Newark.

2340. Cooke, V.
Glasshouse crop protection with modern chemicals.
Agriculture, Lond., 1960, **67**: 392-7, bibl. 3.

Including chlorinated hydrocarbons, systemic and non-systemic organo-phosphorous compounds and persistent acaricides, as used on vegetables and ornamentals.

2341. Kantzes, J. G., Jenkins, W. R., and Davis, R. A.
Control of root-knot nematodes on vegetables on the eastern shore of Maryland with 1,2-dibromo-3-chloropropane-fertilizer mixtures.
Plant Dis. Reptr, 1959, **43**: 1231-5, bibl. 4, illus.

Soil infestations of *Meloidogyne incognita acrita* were successfully controlled in a cantaloupe crop by treating the field at sowing with a mixture of 500 lb./acre of 5–10–5 fertilizer plus 24 or 35 lb./acre of granular dibromochloropropane. Tomatoes were successfully treated 1 week after planting out with either 400 or 500 lb./acre 5–10–10 fertilizer mixed with 24 lb./acre dibromochloropropane.—Univ. Md agric. Exp. Stat., College Park.

2342. Scheller, U.
En för Sverige ny skadegörare i växthus, *Scutigerella immaculata* Newp. part. Michelb. (Symphyla). **(A glasshouse pest, new to Sweden, *Scutigerella immaculata*.)**
Växtskyddsnotiser, 1960, **24**: 38-41, illus.

Good control of the centipede was obtained with an organic phosphorus compound (Ewotox 1 : 3,000) at 7–8 l. per sq. m.

2343. Reid, W. J., Jr., and Cuthbert, F. P., Jr.
Aphids on leafy vegetables: how to control them.
Fmrs' Bull. U.S. Dep. Agric. **2148**, 1960, pp. 16, illus.

The aphids dealt with are *Myzus persicae*, *Brevicoryne brassicae*, *Rhopalosiphum pseudobrassicae*, *Aphis fabae*, *Macrosiphum ambrosiae*, *M. barri* and *M. solanifolii*. Spraying schedules are given for a number of crops including brassicas, celery, lettuce and spinach.

2344. Lane, M. C., and Stone, M. W.
Wireworms and their control on irrigated lands.
Fmrs' Bull. U.S. Dep. Agric. **1866**, revised 1960, pp. 19, illus.

Limonius spp. attacking vegetables and other crops.

2345. Lichtenstein, E. P.
Insecticidal residues in various crops grown in soils treated with abnormal rates of aldrin and heptachlor.
J. agric. Food Chem., 1960, **8**: 448-51, bibl. 16.

Radishes, carrots, beetroot, onions, cucumbers, lettuces, beans and peas were grown in a soil previously treated with 5 and 25 lb. of aldrin and heptachlor per 5-inch acre. Analyses showed that carrots contained the largest insecticidal residue (up to 3·98 p.p.m. from the 25-lb. heptachlor application). A similar application to radishes resulted in the next highest residue (0·59 p.p.m.). At the other end of the scale onions contained no insecticide or only slight traces. Treatment with normal insecticide levels should leave little or no residues within the crops tested. [For earlier work see *H.A.*, 29: 3659.]—Univ. Wis., Madison.

2346. Truelsen, T. A.
Irradiation of potatoes, onions and carrots to inhibit sprouting.
Rep. Danish atom. Energy Commiss. Risö **16**, 1960, pp. 67-8, bibl. 1, illus.

Root development of carrots stored at 12° C. was suppressed following gamma irradiation with a dose of 4 kilorad. The growth of tops was strongly inhibited by 8 kilorad, and completely stopped by 12 kilorad. Sprouting of shallots stored at 12° C. was inhibited for 6 months following irradiation at doses up to 16 kilorad. Onions under the same conditions sprouted soon after irradiation and at first developed more quickly than untreated onions. Six months later, however, control onions showed more sprout development than the irradiated onions. In a second experiment with onions a pronounced stimulation of growth was observed with increasing radiation dose.

2347. Smith, W. H.
The handling and storage of vegetables.
Tech. Circ. Brit. Food Manuf. Ind. Res. Ass., **146**, 1958, pp. 5, bibl. 1, being *Misc. Pap. D.S.I.R. Food Invest.* **29/58**.

Humidity and the CO_2 and O_2 composition of the atmosphere are important factors in the storage of vegetables. Onions should be stored at 32° F. with an R.H. of 70% and adequate air circulation. Compact spherical cabbages with all loose leaves removed may be stored stacked to allow free circulation of cold air. Decayed leaves and rotted areas should be removed at intervals, or twice per season if refrigerated. Cauliflowers and broccoli may be stored at 32° F. and an R.H. of 90–95% for 3 weeks if stored immediately after harvest, but in 10% CO_2 plus 11% O_2 plus 79% N at 32° F. a storage life of 5 weeks is possible. Cucumbers, which are injured at temperatures below 55° F., can only be stored for 14 days. Beetroots are traditionally stored in a clamp covered with straw and a layer of soil, but they may also be stored at 32–34° F. with a high R.H.

2348. Morimoto, K., and others.
Changes of vitamin C in vegetables kept in cold storage.
A.R. nat. Inst. Nutr., Tokyo, 1959, pp. 92-3, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-223.

Retention of vitamin C in green vegetables kept at 0° C. was, at 3 and 7 days respectively: cucumber 75 and 65%; Chinese cabbage 94 and 86%; cabbage 93 and 91%; Japanese radish 88 and 85%; broccoli 100 and 96%. Retention in head lettuce at 3 days was 48%.

2349. Toyosawa, I.
Choline in foods and fodders. V. Choline contents of common Japanese vegetables and mushrooms.
Eiyô to Shokuryô, 1960, **12**: 320-4, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-269.

A determination of the choline contents of 74 vegetables showed that mushrooms, legumes, roots and tubers were generally rich in choline. Particularly high contents were found in brussels sprouts and cauliflowers, with 83·6 mg. and 71·1 mg. per 100 g. respectively.

2350. Payumo, E. M.
The oxalic acid content of some Philippine food plants.
Philipp. J. Sci., 1960, **88**: 221-4, bibl. 7.

A high oxalate content was found in 5 out of 37 leafy vegetables and in 3 out of 34 non-leafy vegetables analysed.

Artichokes.

(*See also* 1732, 1787.)

2351. Beckx, A.
Le cardon, légume opulent. (**The cardoon, a rich vegetable.**)
Courr. hort., 1960, **22**: 238-40, illus.

Notes on varieties, manuring, culture, storage and pests.

2352. M—, G.
Nuove possibilità pratiche di lotta contro l'oidio del carciofo. (**New practical possibilities for controlling artichoke mildew.**)
Tecn. agric., 1960, **12**: 178-9.

Sulphur has proved unsatisfactory for controlling *Leveillula taurica* affecting globe artichokes. Good results were achieved with Karathane, sprayed at 0·06%, and even when as many as 12 treatments were necessary they proved economic, because the quality, as well as the number of heads harvested, was greatly improved.

2353. Prota, R.
Prove di lotta contro le larve endofite e gli adulti di *Sphaeroderma rubidum* Graëlls, dannoso al carciofo in Sardegna. (**Trials on the control of the endophytic larvae and the adults of *Sphaeroderma rubidum* injurious to globe artichokes in Sardinia.** [English summary 11 lines.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 154-9, bibl. 6, illus.

The best results obtained from 3 fortnightly sprays in October-November with 4 products were 80% uninfested leaves with 150 g. 20% emulsifiable Rogor per hl. water, and 76% with 40 g. 50% emulsifiable parathion plus 100 g. 50% DDT wettable powder per hl., compared with 45% in the control. The advantages of the phosphoric esters, especially Rogor, are: (1) a single treatment when most of the adults have gone, i.e., when there is a considerable number of galleries with young larvae, is sufficient for full control, and (2) these insecticides also control other artichoke pests, e.g., *Depressaria erinaceella* and *Hydroecia xanthenes*.—Ist. Ent. agrar., Univ. Sassari.

Asparagus.

(*See also* 1806.)

2354. Ministry of Agriculture, London.
Asparagus.
Bull. Minist. Agric., Lond. **60**, 4th edition 1960, pp. 20, illus.

Sections on stock improvement, cultivation and manuring have been rewritten.

2355. Roorda van Eysinga, J. P. N. L.
Huidige inzichten over de bemesting van asperge, een merkwaardig groentegewas. (**The present position with regard to the manuring of asparagus, a remarkable vegetable crop.**)
Reprint from *Kali*, 1960, No. 44, pp. 120-4, bibl. 4, illus.

Some results from a study of asparagus manuring show that it is particularly important to apply fertilizers before planting. High levels of lime and an organic manure, together with phosphate, are recommended. In established plantations relatively small amounts of fertilizers are needed, viz: 500 kg. nitro-chalk, 500 kg. basic slag and 250 kg. of a potash salt (50%) per ha. The N fertilizer should be given in one application, after cutting, or in two applications, half before and half after cutting. The N should not all be given before cutting.—Inst. Bodemvruchtb., Groningen.

2356. Guyer, G., Hutson, R., and Wells, A.
The bionomics of a coleophorid associated with asparagus spears.
Canad. Ent., 1960, **92**: 721-3, bibl. 1, illus.

Heavy infestation with *Coleophora amaranthella* occurred wherever *Amaranthus* was found in Michigan asparagus fields, and a programme of weed control has been started.—Mich. St. Univ., E. Lansing.

2357. Morris, L. L., and Watada, A. E.
Elongation and bending of asparagus spears.
Calif. Agric., 1960, **14**(11): 15.

If water loss and shrivel can be prevented by other means, the elimination of the moist pad placed under vertically packed spears would reduce elongation and bending.

Brassicas.

(*See also* 1722, 1726, 1750, 1751, 1787, 1792, 1794, 1846, 1897, 2318, 2325, 2330, 2343, 2348, 2349, 3566, 3591, 3600.)

2358. de Vaus, N. K.
Brussels sprouts production in Victoria.
J. Agric. Vict., 1960, **58**: 489-98, illus.

Cultural methods used in an industry that has expanded to more than 500 acres.

2359. Johnson, A. G.
Assessment of vigour and uniformity in brussels sprouts. [Dutch summary 11 lines.]
Euphytica, 1960, **9**: 338-50, bibl. 7.
New breeding methods for brussels sprouts.
Worc. agric. Chron., 1960, **27**: 159-71, bibl. 5.

Work at Wellesbourne on inbreeding followed by hybridization and on the commercial production of hybrid seed [see also *H.A.*, 30: 3737].

2360. NORTH, C.
Studies in morphogenesis of *Brassica oleracea* L. II. The comparative morphology of typical heading-type cabbage plants and non-heading rogues.
J. exp. Bot., 1960, **11**: 395-402, bibl. 6, illus.

Non-heading rogue plants of January King cabbage have as many leaves, and as short vegetative axes, as typical heading plants. Leaves of rogues are generally narrower than those of a corresponding age from headed plants sampled in the same crop, and their dry matter content is higher. Rogue plants of January King sampled in the winter had more advanced flower development than headed plants. [From author's summary.] Heading in cabbage was found to be associated with a low length : width leaf ratio. It is suggested that the accumulation of sugars in the young leaves is associated with factors which determine their shape and prevent them from unfolding, and that rogue plants are relatively inefficient assimilators. [For part I see *H.A.*, 27: 3433.]—Scot. hort. Res. Inst., Mylnefield, Invergowrie.

2361. NIEUWHOF, M., GARRETSEN, F., AND WIERING, D.
Internal tipburn in white cabbage. II. The effect of some environmental factors. [Dutch summary 8 lines.]
Euphytica, 1960, **9**: 275-80, bibl. 1.

Early planting, late harvesting, heavy N fertilization and all factors which stimulate the growth of the head also favour the occurrence of tipburn. There is a positive correlation between the weight of the head and the incidence of the disorder, although at the end of the season there may be an increase in the amount of tipburn without a further increase in head weight. [From authors' abstract. For part I, see *H.A.*, 31: 630.]—Inst. hort. Plant Breed., Wageningen.

2362. SÍVORI, E. M., ESPONDA, M. C., AND RUMI, C. P.
Incorporación de fósforo en compuestos de tejido de repollo. (**Incorporation of phosphorus into compounds in cabbage tissues.**) [English summary ½ p.]
Rev. Fac. Agron., La Plata, 1959, **35**: 157-67, bibl. 41.

A nutrient solution containing P^{32} was supplied to young cabbage plants via the root system, or via the stem base after removal of the roots. The radioactive material was not present in measurable quantities in the nucleic acids or lipids of the plants until more than 24 hours after application to the stem base and more than 48 hours after application to the roots. In the insoluble organic compounds it was detectable within 7½ hours of stem absorption, and in the inorganic and soluble compounds it was detectable after 3½ hours in both the intact and the rootless plants, increasing steadily with time and showing much higher values in rootless than in intact plants.

2363. MENGES, R. M.
Pre-emergence chemical weed control in cabbage.
J. Rio Grande Valley hort. Soc., 1960, **14**: 132-9, bibl. 4.

In 2 field trials the outstanding herbicide was CDEC.

2364. HOLMES, E. S., AND HALSEY, L. H.
Harvesting cabbage with mechanical aids in Florida.
Circ. Fla agric. Exp. Stats **S-114**, 1959, pp. 12, illus.

A description with diagrams of a mechanical harvester, which cuts hand harvesting labour by a half and reduces damage to the heads. [See also *H.A.*, 30: 3725.]

2365. KULPE, M.
Forschungsergebnisse über die Kohllagerung der letzten 30 Jahre. (**Experimental results on the storage of cabbage during the last 30 years.**)
Dtsch. Gartenb., 1960, **7**: 241-3, bibl. 21.

A review of German work.

2366. KELLEY, E. G., AND OTHERS.
Nitrogen compounds of cabbage. I. Relation of non-protein to total nitrogen with special reference to essential amino-acids.
ZACHARIUS, R. M., KELLEY, E. G., AND McGUIRE, J. J.
Idem. II. Chromatographic analysis of non-protein nitrogen.
Food Res., 1960, **25**: 401-13, bibl. 46, and 414-18, bibl. 16, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-223.

Part I deals with the distribution of total N, amino-N in protein and non-protein N and amounts of 10 essential amino-acids in Wisconsin and Danish strains. In part II the major amino-N compounds of the non-protein N fraction recorded were glutamine, *s*-methylcysteine sulphoxide and arginine.

2367. WILLIAMS, A. M.
Winter cauliflower (broccoli). Spring cabbage.
A.R. Rosewarne exp. Hort. Stat., 1959, 1960, pp. 26-34, 35-8.

Winter cauliflower. In the N.I.A.B. trials cutting dates were compared in 6 groups of varieties. In a year when stem weevil attack was not severe, the most successful treatments were those in which dieldrin was applied about 3 weeks after the seed-leaf stage. Results from a nutrition trial did not confirm those of the previous year which suggested that stem rot was related to B deficiency. The percentage of damaged heads during harvesting was slightly increased when tractors were used in the fields for transport. In studies on controlling club-root a pre-planting root dip of 100% pure calomel showed promise. Planting an early variety after mid-July gave much reduced yields at all spacings, but curd quality tended to be poorest from the earliest-planted plots. Similar results were obtained with a late variety, although curd quality was less affected by early planting. *Spring cabbage*. In manurial trials dung and NPK again gave the highest yields; there was little response to potash. Yields were higher from cabbages planted out on 10 September than from cabbages planted later, irrespective of sowing date or top-dressing treatment. Yields in a N top-dressing trial were highest in plots given two applications, in January and March. N.I.A.B. variety trials are also reported briefly.

2368. Helm, J.
Brokkoli und Spargelkohl. Beiträge zur Geschichte ihrer Kultur und zur Klärung ihrer morphologischen und taxonomischen Beziehungen untereinander sowie zum Blumenkohl. (**Broccoli and sprouting broccoli. Contributions to the history of their culture and to their morphological and taxonomical relationships with each other and with cauliflower.**)
Züchter, 1960, **30**: 223-41, bibl. 83, illus.

From the Institute of Research on Cultivated Plants at Gatersleben, Eastern Germany.

2369. Salokangas, K.
Parsakaalin viljelystä. (**Broccoli growing.**) [English summary ½ p.]
Maatalous ja Koetoim., 1960, **14**: 163-70, illus.

Trials on broccoli growing showed that the best time for sowing was early April. With direct sowing on 2 May the crop matured well, but yields were smaller than with transplanting. Varieties suitable for growing in Finland are indicated.—Agric. Res. Centre, Piikkiö.

2370. Anon.
Variedades de coliflor para los valles de Aragua. (**Cauliflower varieties for valleys of Aragua.**)
Not. agríc. Serv. Shell Agric., Venezuela, 1960, **2**: 74-5, illus.

Sultan's Early Patna and Pua-kea have proved very satisfactory, but Snowball does not form heads in the hot climate. Cultural recommendations include the application of borax to the soil to prevent yellowing of the heads, and the protection of the developing heads from the sun by tying the outer leaves over them.

2371. Strachan, G.
Cauliflower discoloration.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 23.

The discoloration produced by heating or treating with acidified brine solution appeared to be non-enzymatic in origin and could be produced by ascorbic acid. Discoloration in cauliflowers could not be entirely attributed to intense insolation.—Lethbridge Res. Stat., Alberta.

2372. Alexander, A. G.
Effects of varying nutrient levels on growth and enzyme activity of cauliflower.
Diss. Abstr., 1960, **21**: 404-5, being *L.C. Card No. Mic.* 60-2915 of 91 pp.

The best growth (i.e., dry weight at final harvest) of cauliflower in sand culture was recorded with medium Mo (0·01 p.p.m.), high Ca (9 me./l.), high Fe (9 p.p.m.), medium B (0·03 p.p.m.), medium Cu (0·02 p.p.m.) and high N (12 me./l.). Medium N (5 me./l.) produced nearly as much growth as high N. Boron deficiency was alleviated by increasing Ca levels; Fe deficiency was reduced by increasing levels of Ca or Fe, but it could not be corrected when either of these elements was low. Phosphatase activity was inhibited by high Mo (1 p.p.m.), whereas medium Mo (0·01 p.p.m.) promoted activity. Activities of phosphatase and ascorbic acid oxidase were increased in conditions promoting dry weight formation, and were depressed as dry weights were depressed. Phosphatase activity was high in plants showing B- or Fe-deficiency symptoms. Peroxidase activity was promoted by increasing the levels of N and Mo but was depressed by high Cu. Symptoms of Fe deficiency were less severe when peroxidase activity was high than when it was low. Catalase activity was promoted by high Mo, whereas medium B exerted a depressing effect. Increasing concentrations of Fe, Ca and B promoted polyphenol oxidase activity and increased dry weights, while high N tended to decrease its activity. Ascorbic acid oxidase activity was enhanced by increasing levels of Mo, when Cu was low, and was depressed by high B at low and medium levels of N. Polygalacturonase was relatively active at low levels of Mo, B and Fe. Plants producing the greatest dry weight had relatively low polygalacturonase activity. [See also *H.A.*, 30: 3745.]—Univ. Md.

2373. Palmer, T. P.
Swede (*Brassica napus*) seeds with split cotyledons. I. The distribution of split cotyledons on plants.
Ann. Bot., Lond., 1960, **24**: 48-51, bibl. 5.

An inherited tendency, affected by environmental conditions but not by certain growth substances.

2374. Klisiewicz, J. M.
Studies on the control of black rot on crucifers with antibiotics.
Diss. Abstr., 1960, **21**: 417-18, being *L.C. Card No. Mic.* 60-3220 of 94 pp.
Klisiewicz, J. M., and Pound, G. S.
Studies on control of black rot of crucifers with antibiotics.
From abstr. in *Phytopathology*, 1960, **50**: 642.

In cabbage seedlings grown from naturally-infected seed in various environments, the highest incidence of *Xanthomonas campestris* occurred at 28° C. at all nutrient levels. Under a 24-hour photoperiod infection was almost double that under a 12-hour photoperiod. Seedling infection was enhanced by soaking the seeds before germination and by growing the seedlings in a moisture chamber. Plant injury was generally caused by the use of antibiotics, its severity increasing with concentration and length of treatment. Monobasic sodium and potassium phosphates, applied as a seed treatment after the antibiotic treatment, reduced injury caused by the tetracyclines. Calcium chloride reduced streptomycin injury but also affected the activity of the antibiotic. Potassium and sodium chlorides provided various degrees of protection from injury by different antibiotics. A 30-minute seed immersion in antibiotic solutions at concentrations up to 0·3% reduced infection to less than 1% with naturally infected seed and to less than 8% on artificially inoculated seed. Antibiotics did not appear to enter the internal seed parts, but were adsorbed onto the seed coat. Some bacterial resistance to streptomycin was observed.—Univ. Wis.

2375. Warren, F. S., and Ayers, G. W.

Resistance to clubroot in swedes.

Commonw. phytopath. News, 1960, **6**: 57.

The Canada Department of Agriculture Research Laboratory at Charlottetown, P.E.I., has isolated 7 races of clubroot in Canadian soils and found no variety of swede resistant in all areas. Wilhelmsburger, however, was immune to all except the uncommon race 1 and to two other races recently isolated. The resistance of other varieties and hybrids is discussed.

2376. Smith, H. C.

Dry rot resistance in swede.

Commonw. phytopath. News, 1960, **6**: 59.

An immunity of 70% to *Leptosphaeria maculans* (*Phoma lingam*) in a New Zealand selection of Crimson King.

2377. Natti, J. J.

Control of downy mildew of broccoli with fungicides and fungicide-streptomycin combination sprays.

Plant Dis. Reptr, 1959, **43**: 735-40, bibl. 11.

Copper-Zinc, Copper-Zinc plus streptomycin, maneb plus streptomycin, and Agrimycin 500 were the most effective of the materials tested in the field for the control of downy mildew of broccoli. The combination of Copper-Zinc plus streptomycin, although only slightly more effective than Copper-Zinc alone during the time of spray applications, was far more effective than Copper-Zinc when evaluated 21 days after the final spray application. Maneb plus streptomycin, although equally as effective as Copper-Zinc as a protective spray during the period of spray applications, did not provide control after the discontinuance of spray applications. The incidence of infected broccoli heads was less in plots sprayed prior to the development of heads than in plots sprayed only during the period of head development. [Author's summary.]—N.Y. St. agric. Exp. Stat., Geneva.

2378. Winstead, N. N.

Reaction of cabbage varieties and clubroot-resistant lines to root-knot nematodes.

Plant Dis. Reptr, 1959, **43**: 1280-1, bibl. 1.

Plants of the cabbage varieties Badger Market, Copenhagen Market, Early Round Dutch, Jersey Queen and Oakview were susceptible to *Meloidogyne incognita incognita*, *M. incognita acrita*, *M. arenaria arenaria*, *M. javanica* and *M. hapla*. Clubroot-resistant lines were also susceptible. No differences in the susceptibility of the various lines and varieties were noted. Root-knot indices of plants inoculated with *M. arenaria arenaria* were lower than those of plants inoculated with *M. incognita incognita*, *M. incognita acrita* and *M. javanica*. All varieties and lines were affected less severely by *M. hapla* than by the other species and subspecies tested.—[Author's abstract.]—N.C. St. Coll., Raleigh.

2379. Kayashami, I.

Studies on spiders as natural enemies of crop pests. (1) The daily activities of spiders in cabbage fields, establishment of spiders liberated in the fields and evaluation of the effectiveness of spiders against crops pests.

[Japanese, with English summary $1\frac{1}{2}$ pp.]

Sci. Bull. Fac. Agric. Kyushu, 1960, **18**: 1-24, bibl. 17, illus.

One species of spider, *Misumena tricuspidata*, was very effective in controlling cabbage pests and did not attack beneficial insects. This species was easy to multiply in the laboratory and to establish in the field.

2380. Cass, L. M.

Control of the cabbage aphid, *Brevicoryne brassicae* (L.), with various insecticides at Stouffville, Ontario, in 1958.

Proc. ent. Soc. Ont., 1959, 1960, **90**: 54, bibl. 3.

Emulsifiable concentrates of Systox, schradan and NC 262, at 8, 16 and 8 oz./acre respectively, gave excellent control in a trial of 7 insecticides.

2381. Wright, D. W., Hughes, R. D., and Worrall, J.

The effect of certain predators on the numbers of cabbage root fly (*Erioischia brassicae* (Bouché)) and on the subsequent damage caused by the pest.

Ann. appl. Biol., 1960, **48**: 756-63, bibl. 6, illus.

(Wright, D. W.)

Control of cabbage root fly.

Pest Technol., 1960, **3**: 48-9.

To determine the importance of beetle predators on the natural control of cabbage root-fly, experiments were carried out in 1958 and 1959 using various types of barriers to obtain different levels of beetle populations on cauliflower plots. On plots where the beetle population (mainly *Bembidion lampros*) was high, root-fly infestation and crop damage were considerably reduced. Where the soil round the plants was treated with dieldrin the root-fly population was reduced to a minimum, crop yields were considerably increased and the predator population was not seriously affected. The insecticide, however, did reduce the numbers of predatory beetles when it was applied broadcast.—Nat. Veg. Res. Stat., Wellesbourne.

2382. READ, D. C.
Control of root maggots in rutabagas, cabbages and related plants in the Maritime Provinces.
Publ. Canad. Dep. Agric. **1075**, 1960, pp. 8, illus.

Hylemyia brassicae and its control by heptachlor or aldrin soil treatment.

2383. READ, D. C.
Control of root maggots attacking cruciferous crops, mainly rutabagas, grown in ridges.
Canad. J. Plant Sci., 1960, **40**: 721-8, bibl. 6.

Experiments in 1958 and 1959 with pre-planting soil treatments of insecticides, applied in a 5-inch band 1½ inches below the seed in ridges of soil, showed that heptachlor, aldrin and chlordane, each at 5 lb. per acre, gave 70 to 90% reduction in damage due to *Hylemyia* spp. in cruciferous crops in Prince Edward Island. Each of these insecticides gave better control of the second than of the first generation of maggots. Nematocide 18,133 at 5 and at 10 lb. per acre gave complete control throughout the growing season and also gave the highest yield. Thimet at 5 and at 10 lb. gave better control than the chlorinated hydrocarbons; parathion and Guthion, at the same rates, gave better control of the first generation but not such effective control thereafter. Korlan at 6 lb. gave fair control of the first generation but was ineffective thereafter. Ethion, Trithion, Di-syston and diazinon, each at 5 and at 10 lb., and Co-Ral and Dylox at 5 lb. were ineffective. Diazinon was highly phytotoxic. [From author's abstract. For previous work see *H.A.*, 29: 488.]—Canada Dep. Agric., Charlottetown, P.E.I.

2384. SWAILES, G. E.
Laboratory evaluation of resistance in rutabaga varieties to the cabbage maggot, *Hylemya brassicae* (Bouché) (Diptera : Anthomyiidae).
Canad. Ent., 1960, **92**: 958-60, bibl. 2.

Larvae were reared on root cores of several swede varieties. Similarities between pupal weights and duration of larval periods suggested that once established the larvae thrive equally well on all varieties. In the variety Wilhelmsburger resistance found in the field [see *H.A.*, 30: 2168] was shown to be resistance to initial feeding. Survival of larvae was low on Canadian Gem because of their failure to become established on the root cores and because of high mortality in the 2nd and 3rd instars.—Canada agric. Res. Stat., Lethbridge, Alberta.

2385. WILSON, F.
The effectiveness of a granulosis virus applied to field populations of *Pieris rapae* (Lepidoptera).
Aust. J. agric. Res., 1960, **11**: 485-97, bibl. 5.

Sprays of aqueous suspensions of the virus (apparently *Bergoldia virulenta*) applied to the larvae reduced the population on cabbages and very few reached the pupal stage.—C.S.I.R.O., Canberra.

2386. MCDANIEL, I. N., HEPLER, P. R., AND MURPHY, E.
Bacterial insecticide shows promise in imported cabbageworm control.
Me Fm Res., 1960, **8**(2): 16-20, illus.

The life history of *Pieris rapae* and control obtained with the bacterial insecticide *Bacillus thuringiensis* are described. Results of trials to compare sprays of *B. thuringiensis* (25 billion spores/g. applied at 1 lb./acre) with DDT and chlordane applied prior to head formation followed by malathion, and with malathion alone (all applied at 1 lb. active material/acre) showed that, whilst the bacterium and malathion sprays gave only fair control compared with the DDT and chlordane treatments, a high degree of protection was obtained with the bacterium. In all cases spraying should be carried out every 7-10 days.

2387. HUGHES, W. A.
Growth stimulation of cabbage by dieldrin.
Plant Path., 1960, **9**: 149, bibl. 2.

When roots of the variety Paragon were dipped in a 0·05% dieldrin emulsion prior to transplanting a significant increase in the weight of marketable heads resulted. Dipping in calomel plus dieldrin (1 oz. of pure calomel per pint of 0·05% dieldrin) increased weight to a lesser degree.—Edinb. Sch. Agric.

Celery.

(*See also* 2331, 2343, 2760.)

2388. WEBSTER, A. B.
Celery varieties and gibberellic acid at Levin Research Station.
N.Z. comm. Gr, 1960, **16**(4): 5, 7, 9, illus.

In a trial of 10 varieties green varieties showed better qualities than self-blanching varieties. Applications of GA, 3 weeks before harvest, increase stalk lengths by an average of 1·8 in. per plant, but rotting in the centre was also increased in susceptible varieties, thus reducing yields.

2389. ORSENIGO, J. R.
Celery herbicide investigations on organic soil: a résumé.
Proc. 13th annu. Mtg south. Weed Conf., 1960, pp. 78-82, bibl. 6.

Particularly promising results have been given by Karsil (N-(3-4-dichlorophenyl)-2-methylpentanamide) applied at 1 lb./acre to seed beds at the 2-4 leaf stage and also after transplanting. With post-transplanting treatments good results were also shown by CDEC, CDAA, chlorpropham, EPTC, propazine and CDEC + CDAA ± chlorpropham.—Everglades Exp. Stat., Fla.—From *Weed Abstr.*, **9**, No. 1409.

2390. NELSON, R.
Bacterial petiole spot of celery.
From abstr. in *Phytopathology*, 1960, **50**: 648.

Highly susceptible varieties include Cornell-19 and Utah 52-70. Satisfactory commercial control is obtained where copper is included as a surface protectant throughout the season.

2391. LEWIS, G. D.
Effects of temperature and crop rotation on the occurrence of brown spot of celery in southern New York.
Plant Dis. Reptr, 1959, **43**: 1079-80, bibl. 3.

The incidence of brown spot (*Cephalosporium apii*) was found to be related to high summer temperatures. Lesions caused by this pathogen developed more rapidly at 75° F. than at 55° F. Observations in commercial fields indicate than the pathogen is soil-borne, but does not survive long in the absence of celery.—Rutgers Univ., New Brunswick, N.J.

2392. ANON.
Lancashire men make their own celery washers.
Grower, 1960, **54**: 1038-9, illus.

Two washers are described. One is a rotary washer, with a normal output of 45 heads per minute, washed and boxed. In the second the heads are hung from a top conveyor to pass through the sprayer; output is about 18 heads per minute.

Cucurbits.

(*See also* 1730, 1733, 1750, 1751, 1769, 1815, 1896, 1897, 2322, 2324, 2325, 2339, 2341, 2348, 2608, 3573.)

2393. TORFASON, W. E., AND NONNECKE, I. L.
A study of the effects of temperature and other factors upon the germination of vegetable crops. III. Vegetable vine crops.
Canad. J. Plant Sci., 1960, **40**: 596-606, bibl. 10.

A study was made of the effects of temperature and duration of exposure upon the germination of cucumber, muskmelon and watermelon seeds. Seeds of four varieties of each crop were germinated at controlled temperatures. Muskmelon seed germination was significantly reduced as the temperature decreased from 60° F. through 55° and 50° to 45° F. On the other hand, germination of cucumber and watermelon seed was not significantly altered by temperature. Prolonging the duration of exposure to 15 or 22 days resulted in significant reductions in the germination of watermelons but not of the other crops. The interaction of temperature with duration of exposure caused significant differences in the germination of the three crops. At 45° and 50° F. germination decreased generally as exposure lengthened to 15 days and then increased sharply at 22 days. At 55° and 60° F. germination increased slightly as exposure increased to 8 or 15 days, followed by a decrease at 22 days; this effect was most pronounced at 60° F. It is concluded that satisfactory germination can be obtained after relatively long exposure to temperatures lower than the previously accepted minima. [From authors' abstract. For part II dealing with peas see *H.A.*, 29: 2493.]—Canada agric. Res. Stat., Lethbridge, Alberta.

2394. VASIL, I. K.
Studies on pollen germination of certain Cucurbitaceae.
Amer. J. Bot., 1960, **47**: 239-47, bibl. 43, illus.

Pollen grains of 8 members of the family Cucurbitaceae were cultured in artificial nutrient media. Among the sugars sucrose proved to be the best for germination of pollen. Although growth regulators, vitamins, antibiotics and some other chemical substances also improved germination of pollen and length of pollen tubes, the effect of boric acid (0·005–0·02%) and borax (0·01%) was most outstanding. [From author's abstract.] In practice sprays of boric acid and borax can be used to improve fruit set, where failure of pollen tube growth occurs in the style.—Univ. Delhi.

2395. TURNER, E. A.
Cucumber growing—the straw bale technique.
Comm. Gr, 1960, No. 3384, pp. 1043-7, illus.

The author describes the method of using straw bales as a base for cucumber beds. The bales are sprinkled with nitrochalk which is watered in, and when fermentation has begun the bales are covered with soil. More water is required by straw bale beds than by other forms of bed, and a low level sprinkler system is recommended for watering. Trials have shown that yields from cucumber plants grown on straw bale beds compare satisfactorily with those from other types of bed.—Efford exp. Hort. Stat.

2396. BOWERS, J. L.
Cucumbers grown for pickling.
Arkans. Fm Res., 1960, **9**(5): 11, illus.

Investigations to find a replacement for the variety Model, which develops many poorly shaped fruits with light-coloured blossom ends, are reported. The selection Ark No. 1 has a cluster bearing habit, produces yields similar to those of Model and has good pickling qualities, the fruit colour and shape being superior to Model. Ark No. 3 and Ark No. 4 produce excellent small fruits but the larger fruits tend to be too short. All 3 varieties lack anthracnose resistance.

2397. PETERSON, C. E.
A gynoecious inbred line of cucumber.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 40-2, illus.

Produced with the aid of gibberellin-induction of staminate flowers on gynoecious plants [see *H.A.*, 30: 5408].

2398. ŠTAMBERA, J.
Vliv postřiků 2,3,5-trijodobenzoovou kyselinou na vývoj a plodnost okurek skleníkovych odrůd. (**Effects of spraying with 2,3,5-triiodobenzoic acid on the development and fertility of glasshouse cucumber varieties.**) [Russian, German and English summaries ¼ p. each.]
Rostlinná Výroba, 1960, **6**: 483-8, bibl. 4.

The variety Best of All was sprayed with a solution of 0·002% 2,3,5-TIBA. This inhibited the growth of the main axis and induced growth of the laterals and the appearance of female flowers, which arose almost regularly in the axils of the lateral shoots. Harvest was 10–12 days earlier than in the controls, but total yields were low. When a soil dressing of a 9 : 1 mixture of oxblood and water was also applied, yields were higher and the harvest was 5 days earlier than in the controls.

2399. GALUN, E., AND ATSMON, D.
The leaf-floral bud relationship of genetic sexual types in the cucumber plant.
Bull. Res. Coun. Israel, Sect. D, 1960, **9D**: 43-50, bibl. 9, illus.

The stages of development of floral buds are illustrated and their rates of differentiation examined in 4 genetic sexual types of cucumber. It was found that floral buds reached more advanced stages in the axils of young leaves in the gynoecious plant than did male flower buds in the monoecious plant; the same was also true for the hermaphrodite plant as compared with the andromonoecious plant.—Weizmann Inst. Sci., Rehovoth.

2400. VAN KOOT, Y.
De invloed van bijen op het ontstaan van zaadkoppen bij komkommers. (**The influence of bees on the occurrence of bull-necked cucumbers.**) [English summary ½ p.]
Meded. Dir. Tuinb., 1960, **23**: 735-49, 764, bibl. 1, illus.

Bull-necked cucumbers follow pollination by bees, bumble bees or hover flies, whose relative activity may be expressed as 100, 80 and 1, respectively. Spotvrije is a variety which is particularly liable to produce bull-necked fruits. Crops are more likely to produce bull-necked fruits late in the season. With long days and high night temperatures in July many male and few female flowers are formed, and the female flowers seem less likely to develop parthenocarpically. The production of male flowers and pollination were not stopped by spray applications of growth substances or gametocides. In the Westland area the enforcement of bee regulations has reduced the occurrence of bull-necked cucumbers.—Proefst. Groent. Fruit. Glas, Naaldwijk.

2401. ITAGI, T., AND ITO, H.
Tests on the treatment of cucumber vines. I. Influence of tipping vines and removing the lower leaves on growth and yield. [Japanese, with English summary ⅓ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 35-40, bibl. 4, illus.

Vines increased in vigour when they were tipped to reduce their total height and also when some leaves were removed, but yields decreased by 4–6% and 8–10%, respectively. The decrease in the yield of tipped vines was less, and the fruit was of higher quality, when 8–10 leaves were left below a fruit-bearing node than when no leaves were removed or than when only 5 leaves were left below a fruit-bearing node. To limit the decrease in the yield of pruned vines to less than 10%, defoliation, leaving 8 leaves below each fruit-bearing node, should be carried out every 20 days during the growing period.

2402. COOK, J. A., AND PFLUG, I. J.
Preliminary studies of hydro-cooling of pickling cucumbers.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 129-31.

Pickling cucumbers were pre-cooled with air and water and stored for 2–4 days at several temperatures prior to manufacture as fresh whole dill pickles. These preliminary trials showed that hydro-cooling for as long as one hour did not adversely affect pickle quality and indicated that hydro-cooling may be more effective than air-cooling for retarding deterioration. [Authors' summary.]

2403. Furner, B. G.
A trial of cantaloups and water-melons.
Gdnrs' Chron., 1960, **148**: 604-5, illus.

Notes on varieties from Russia, Japan, the U.S.A. and Britain, tested in Britain and Belgium.

2404. Brantley, B. B., and Warren, G. F.
Sex expression and growth in muskmelon.
Plant Physiol., 1960, **35**: 741-5, bibl. 27.

Medium and high N levels and long days generally each increased the number of staminate and perfect flowers as well as the proportion of perfect flowers [see also *H.A.*, 29: 435]. However, at a medium concentration of N (100 p.p.m.) long days increased the number of staminate flowers but had no effect on perfect flowers. The number of staminate and perfect flowers was decreased by NAA under long days, with a greater reduction in staminate flowers. Under short days 0·01 p.p.m. NAA increased both but caused a greater increase in the number of perfect flowers. Higher concentrations under short days caused a depression in total flowering. Medium and high N levels and long days increased the fresh and dry weights of the plants. The number of nodes was increased by N, but photoperiod had no effect. The length of the internodes was increased by long days and by raising the N level. All concentrations of NAA reduced the number of nodes and weight of the plants under long days but had little effect on plants grown under short days. [From authors' summary.]—Purdue Univ., Lafayette, Ind.

2405. Masui, M., and others.
Studies on the absorption of nutrient elements in muskmelon. II. On nitrogen, potassium, calcium and magnesium levels. [Japanese, with English summary $\frac{3}{4}$ p.]
J. hort. Ass. Japan, 1960, **29**: 147-56, bibl. 5.

Nitrogen reduced growth, leaf, stem and fruit weights, soluble solids of the fruit and the pH of the soil. Potassium also reduced growth, soluble solids and soil pH, whereas magnesium only lowered soluble solids and soil pH. Calcium, on the other hand, increased growth, leaf, stem, fruit and root weights, soluble solids and soil pH and also improved the external appearance of the fruit. The interactions between N and K were unfavourable, and those between N and Ca, and Ca and Mg favourable. The most favourable nutrient levels per plant were 7 g. N, 10 g. K_2O, 40 g. CaO and no Mg. [For part I, see *H.A.*, 31: 671.]

2406. Ivanoff, S. S.
Types of injuries on cantaloupe leaves associated with guttation.
From abstr. in *Phytopathology*, 1960, **50**: 640.

Chemical substances exuded through leaf hairs may cause yellowing and blighting of entire leaves. The exudation of droplets may occur in particular loci or it may cover a considerable portion of the leaf. The whitish crystalline or amorphous lumps left on guttating surfaces after evaporation may follow a circular pattern. They may or may not cause injury, depending on conditions favourable or unfavourable for their reabsorption. Two modes of injurious action seemed to be involved, one proceeding from within the tissue, the other resulting from chemical action on the surface. The role of particular inorganic salts (NaCl, KCl, K_3PO_4, Na_2HPO_4, etc.) on the type of injury was studied. Different salts produced different types of lesion on the leaf tissue. Guttation through leaf hairs and possibly other epidermal structures, as distinguished from marginal drop guttation through hydathodes, was widely observed and seemed to be a general phenomenon, although frequently overlooked.

2407. (Stewart, J. K., and Lipton, W. J.)
Hydrocooling cantaloups.
Agric. Mktg, 1960, **5**(9): 14, illus.

Internal temperature changes in cantaloups of various sizes and with different initial temperatures were observed during cooling in a pilot flood-type hydro-cooler. Results showed that: (1) the water flow should be at least 10 gal./min./sq. ft. of cooler area, (2) the cantaloups may be 4 layers deep without affecting cooling, (3) a wetting agent does not improve cooling, and (4) the melons must be packed and loaded without delay into a refrigerated car or truck because the fruit warms rapidly when exposed to the summer air. Hydro-cooled melons may be shipped in fibreboard instead of wooden boxes.

2408. Kurata, H.
Studies on the formation of female flowers in *Cucurbita*. I. Photoperiodic responses of *Cucurbita moschata*. [Japanese, with English summary 7 lines.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 168-72, bibl. 19.

Female flower initiation occurred in the variety Shiro-kikuza when 6 sq. cm. or more of leaf area were exposed to light for periods of not less than 6 hours and not more than 10 hours, together with a minimum of 12 hours and maximum of 14–16 hours of darkness. Responses appeared after 6 or more treatments.

2409. Godnev, T. N., and Akulovič, N. K.
On the nature of the pigments of the protochlorophyll group. [Russian.]
Doklady Akad. Nauk SSSR, 1960, **134**: 710-12, bibl. 10.

The absorption spectra were determined of extracts and chromatographically pure solutions of protochlorophyll from the seed coats of *Cucurbita pepo* at different growth stages. Initially the maximum absorption occurred at 432 mμ and later it shifted to 438–440 mμ.

2410. Spurr, A. R., and Davis, N.
New watermelon, Klondike RS-57, for long distance shipping.
Calif. Agric., 1960, **14**(6): 5.

Developed from Blue Ribbon × Ironsides, the new variety resembles Blue Ribbon in disease resistance, flesh colour and soluble solids content but is larger and of slightly lower quality. The rind is tough, making the variety suitable for long distance shipping.—Univ. Calif., Davis.

2411. Lippert, L. F.
Seedless watermelons in southern California.
Calif. Agric., 1960, **14**(11): 14.

Five lines of seedless, triploid watermelons yielded an average of 10 tons per acre of 10–12-lb. fruits of satisfactory quality.

2412. Thakare, R. G., and Bora, K. C.
Influence of neutron radiation on sex-ratio in *Citrullus vulgaris* (watermelon).
Curr. Sci., 1960, **29**: 322-4, bibl. 11.

Seeds exposed to neutron irradiation at a dosage of 1×10^{12} np./cm.^{2} produced plants differing little from the controls in time of flowering and sex ratio. When the dosage was increased to 5 or $7 \cdot 5 \times 10^{12}$ np./cm.^{2}, however, anthesis was delayed by about 3 weeks, the number of female flowers was increased and the number of male flowers was decreased.—Atomic Energy Establ., Trombay.

2413. Akiya, R., Ito, K., and Kondo, Y.
Studies on the root system of cucurbits. I. Varietal differences in the root-system of watermelon. [Japanese, with English summary ¼ p.]
J. hort. Ass. Japan, 1960, **29**: 121-5, bibl. 9, illus.

Examinations were made of the root systems of a variety selected for dry paddy or clay soils, one adapted to volcanic ash upland soil, a warmer region type, hybrids of these, and triploid and tetraploid varieties. The clay-soil variety had shallow, spreading, slender roots and the volcanic-ash type deep, thick roots. The hybrids and polyploids had vigorous root systems with deep, thick roots, with much branching.

2414. Sherf, A. F.
Cucumber mosaic virus.
Amer. Veg. Gr, 1960, **8**(9): 23, illus.

Resistant varieties are Challenger, Tablegreen, Sensation Hybrid, Jet, Ohio MR 17, Ohio MR 25, and the pickle types Wisconsin SMR 12, 15 and 18, and Nappa 61. The elimination of perennial weeds in which the virus overwinters is recommended.—Cornell Univ.

2415. Anon.
Variedades de melón resistentes al moho. **(Melon varieties resistant to mildew.)**
Not. agríc. Serv. Shell Agric., Venezuela, 1960, **2**: 87-8, illus.

Nine varieties listed as resistant to *Erysiphe cichoracearum*.

2416. Fisher, R. W.
Polybutenes—a promising control for powdery mildew.
Plant Dis. Reptr, 1959, **43**: 878-9, bibl. 1, illus.

Five per cent emulsions of polybutenes were applied to powdery mildew-susceptible cucumber plants in a greenhouse. The sprays provided excellent protection from infection for at least a month. The polybutenes also showed promise in eradicating established infections on roses and cucumbers. [Author's abstract.]—Canada Dep. Agric., Res. Branch, Vineland, Ont.

2417. Winstead, N. N., and Riggs, R. D.
Reaction of watermelon varieties to root-knot nematodes.
Plant Dis. Reptr, 1959, **43**: 909-12, bibl. 5.

Each of the 83 watermelon varieties and lines tested was susceptible to *Meloidogyne javanica*, *M. incognita incognita*, *M. incognita acrita* and *M. arenaria arenaria*. All the varieties tested were resistant to *M. hapla;* however, a slight amount of reproduction occurred on all varieties. [Authors' summary.]—N.C. St. Coll., Raleigh.

2418. Srinivasan, P. M., and Narayanaswamy, P. S.
Beating the pests of bitter-gourd.
Indian Fmg, 1960, **10**(7): 17, 19, illus.

Although 0·02% endrin and 0·025% parathion gave slightly better control of fruit fly (*Dacus cucurbitae*) and beetle (*Epilachna* sp.), the highest yield of *Momordica charantia* was obtained after treatment with 0·1% DDT.

Legumes—beans.

(*See also* 1694, 1696, 1711, 1712, 1714, 1716, 1723, 1724, 1747, 1749, 1750, 1757, 1760, 1761, 1767, 1773, 1776, 1777, 1790, 1801, 1803-1805, 1815, 1854, 2318, 2330, 2332, 2339, 2470, 2533, 3570, 3604.)

2419. Stephens, T. S., and Correa, R. T.
Evaluation of green bean varieties suitable for processing.
J. Rio Grande Valley hort. Soc., 1960, **14**: 149-68, bibl. 5.

The characteristics studied in this 6-season evaluation of 18 varieties and 7 strains of green beans were yield, desirable pod features, sieve size, seed percentage and percentage of crude fibre. The most suitable varieties proved to be Topcrop, Pearlgreen and Topmost.—U.S.D.A. and Tex. agric. Exp. Stat., Weslaco.

2420. CAMPBELL, J. A.
New bean Longval highest producer in Station tests.
Miss. Fm Res., 1960, **23**(4): 2, illus.

In trials over 2 years Longval [see *H.A.*, 29: 3608] gave the highest yield of 3 oval pod varieties, averaging 353 bu. per acre. Consumer preference was also strongly in favour of Longval. Of the round pod varieties tested Extender, with 320 bu. per acre, was the top yielder. In manurial trials the highest yields were obtained with 50-80-50 lb. NPK per acre applied in the drill before planting, followed by a side-dressing of 150 lb. ammonium nitrate per acre.

2421. HAMMETT, H. L.
Thaxter, new lima bean, yields well in Station trials.
Miss. Fm Res., 1960, **23**(4): 7.

Of 5 varieties tested Thaxter produced the highest yield over 2 years. Where nematodes were a problem the resistant variety Nemagreen outyielded other varieties.

2422. TEDORADZE, S. G.
The role of bees in the production of new varieties of beans in Georgia. [Russian.]
Pchelovodstvo, 1959, **36**(9): 40-2, from abstr. in *Bee World*, 1960, **41**: 251.

Only 6·2% of *Phaseolus multiflorus* flowers isolated from insect visitation set fruit, while 71·7% of those visited by bees produced pods. In breeding work only 2·35% of emasculated flowers set fruits after hand pollination, of which 0·3% were hybrids; of bee-pollinated emasculated flowers the fruit set was 92·28%, and of these 27% were hybrids.—Georgian Select. Exp. Stat., U.S.S.R.

2423. CARDONA, C., DUARTE, R., AND MANCINI, S.
El uso de la radiación artificial en la agricultura y su aplicación al fríjol en Colombia. **(The use of artificial radiation in agriculture and its application to beans in Colombia.)**
Agric. trop., Bogotá, 1960, **16**: 514-23, bibl. 18.

Bean (*Phaseolus vulgaris*) seeds of 4 varieties were exposed to 5,000, 7,500 and 10,000 r and sown at 2 localities. In the R_1 generation the germination percentage was appreciably reduced, especially at 10,000 r, and the plants showed leaf deformities, mosaic symptoms, chlorophyll deficiency and slow growth. There were 9 mutations of slight value out of 3,600 plants, but none showed disease resistance or superior agronomic characters. In the R_2 and R_3 generations, likewise, there were no plants with superior characters.

2424. LOWIG, E.
Beobachtungen bei der Exsikkation von Bohnensamen. **(Observations on excessive drying of bean seeds.)**
Saatgut-Wirtsch., 1960, **12**: 247-9, illus.

Seeds of the runner bean variety Meisterstück lost their capacity to germinate in sand when dried to a water content of 8%. If, however, immediately after drying the seeds were kept at a relative humidity of 60–70% so that their water content rose to 10%, germination was almost normal. A new dwarf bean variety behaved differently, in that drying did not impair the capacity of the testa to imbibe water under suitable conditions. Meisterstück seeds germinated after drying, even when they were not transferred to a higher relative humidity, provided the injured seed coats were scraped off.

2425. MONTALVO S., R.
Densidad de siembra en el cultivo del frijol—1958. **(Sowing density in bean crops, 1958.)**
Inf. mens. La Molina, 1959, **33**(384): 5-15.

For mechanical sowing the optimal inter-row distance was 0·4 m. for the varieties Red Kidney and Panamito, and 0·4–0·6 m. for Canario, which was about twice as productive as either of the other varieties and gave almost as high a yield from 75 as from 150–300 kg. of seed per ha. An increase in seed rate to 150 kg./ha. was profitable with Red Kidney, but Panamito gave inconclusive results. Increasing the seed rate did not affect pest infestation, disease incidence or seed quality, but it reduced the number of pods per plant and the number of seeds per pod.

2426. CORREA, R. T., AND STEPHENS, T. S.
The effect of row spacing on green bean varieties.
J. Rio Grande Valley hort. Soc., 1960, **14**: 140-8, bibl. 7.

Increases of 31 to 130% in the yield of beans were obtained by planting in paired rows 12–14 in. apart on 38-in. beds, compared with single rows 38 in. apart. The minimum row spacing for Topmost, Pearlgreen and Tenderwhite was 12 in., but between 6 and 12 in. could be used for Topcrop, Harvester and Earligreen. No organoleptic differences due to spacing could be detected.—Tex. agric. Exp. Stat. and U.S.D.A., Weslaco.

2427. AGNEW, G. W. J.
French bean variety and spacing trial.
Qd J. agric. Sci., 1959, **16**: 283-90, bibl. 4.

Yields from 2 new rust-resistant varieties were considerably greater than those of Brown Beauty and comparable with those of St. Andrews. Plant weight at maturity and number of flowers per plant increased with increments in plant spacing within the row from 2 in. up to a maximum of 6 in. Differences in percentage pod set were obtained for varieties but not for plant spacings in and between rows. Maximum pod set occurred in St. Andrews. Weight loss in cased beans during a 6-day storage period was influenced by variety rather than tightness of the pack. [From author's summary.]

2428. Corey, R. R.
The effect of streptomycin on bean cotyledons in culture.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xviii.

During the growth of the variety Kentucky Wonder under germ-free conditions and in the presence of streptomycin it was observed that cotyledons which fell from the plants remained green and frequently developed vegetative shoots and roots. When cotyledons were cultured in the presence of various streptomycin concentrations, it was found that 10 μg. per ml. stimulated differentiation and plantlet formation.—Univ. Arkansas, Fayetteville.

2429. Dycus, A. M.
Studies on root response in *Phaseolus vulgaris* to applications of gibberellic acid to stem tip, primary leaves, and in the nutrient solution.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxxiv.

Roots showed a growth response to GA concentrations which had no promoting effects on the shoots. When equivalent concentrations were applied to the shoot apex or primary leaves, there was a top growth stimulation, but the roots were unaffected. At concentrations greater than 0·001 p.p.m. both roots and shoots responded. When mature bean plants were treated with 1 p.p.m. of GA, root elongation occurred but there was no stimulation of top growth.—Ariz. St. Univ., Tempe.

2430. Linck, A. J., and Sudia, T. W.
The effect of gibberellic acid on the absorption and translocation of phosphorus-32 by bean plants.
Amer. J. Bot., 1960, **47**: 101-5, bibl. 8, illus.

Bean plants treated with 1 p.p.m. GA, supplied to the roots for 4 hours, were compared with untreated plants for P^{32} uptake. In plants grown under conditions of both high and low humidity P^{32} uptake was significantly higher after GA treatment than in the control. Low humidity favouring transpiration was associated with the highest uptake of P, which was found in largest amounts in the most actively growing parts. With high humidity relatively more P accumulated in the lower parts of the plant.—Univ. Minn., St. Paul.

2431. Corgan, J. N., and Hibbard, A. D.
The effect of moisture stress on uptake and translocation of phosphorus in red kidney beans.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): iv.

Moisture stress was varied by adding mannitol to the root medium, which was either a nutrient solution or a soil suspension. Concentrations of mannitol up to 0·5 M produced no detectable change in the rate of P^{32} uptake with P concentrations of up to 100 p.p.m. The movement of P^{32} to the plant tops was much greater from the nutrient solution than from the soil suspension. [For related work on other species, see *H.A.*, 29: 3257.]—Univ. Missouri, Columbia.

2432. Applegate, H. G., Adams, D. F., and Carriker, R. C.
Effect of aqueous fluoride solutions on respiration of intact bush bean seedlings. I. Inhibition and stimulation of oxygen uptake.
Amer. J. Bot., 1960, **47**: 339-45, bibl. 31.

Intact bush bean seedlings were infiltrated with 1×10^{-1}, 1×10^{-2}, 1×10^{-3}, and 1×10^{-4} M fluoride. A linear relationship was found to exist between the fluoride concentrations of the infiltrating solutions and tissue fluoride. The higher fluoride concentrations inhibited O_2 uptake, whereas the lower fluoride concentrations accelerated it. Both the inhibition and acceleration of O_2 uptake by fluoride were modified by light, CO_2 and the presence or absence of chlorophyll.—Wash. St. Univ., Pullman.

2433. Applegate, H. G., and Adams, D. F.
Effect of atmospheric fluoride on respiration of bush beans.
Bot. Gaz., 1960, **121**: 223-7, bibl. 26.

Bean plants were exposed to atmospheric fluoride either continuously from planting to harvest or for 24 hours before sampling at various growth stages. Oxygen uptake was accelerated with fluoride levels below those inducing visible fluorosis symptoms. Where 24-hour fumigations were given, the fluoride uptake increased until the seedling had fully emerged, and then remained relatively constant from the 8th to the 20th day of growth. Continuously fumigated plants showed steadily increasing amounts of tissue fluoride throughout their growth.—Wash. St. Univ., Pullman.

2434. Applegate, H. G., and Adams, D. F.
Nutritional and water effect on fluoride uptake and respiration of bean seedlings.
Phyton, 1960, **14**: 111-20, bibl. 14.

Bean plants (*Phaseolus vulgaris*) were grown in an atmosphere containing $2{\cdot}0 \pm 0{\cdot}21$ μg.F^-/m^3 (1·6 p.p.b.). The effect of N, P, K, Fe and Ca deficiencies and the effect of osmotic pressures of 0, 1·5, 3·0, 4·5, 6·0 and 7·5 lb. on fluoride uptake and fluoride-mediated respiration were studied. The data showed that P-deficient plants took up more fluoride than plants deficient in any of the other elements studied. Fluoride-mediated respiration, however, was dependent on P. Plants low in Fe or K showed increased uptake of fluoride.

Nitrogen had no effect on fluoride uptake under the conditions of this experiment. Plants low in Fe showed inhibition of oxygen uptake. This inhibition was accentuated by fluoride. The interactions of N, K and Ca with fluoride on respiration were complex. Neither fluoride uptake nor fluoride-mediated respiration appeared to be linked directly to the water economy of the plants. [From authors' abstract.]—Wash. St. Univ., Pullman.

2435. Teixeira Constantino, A.
O feijão de Angola. Alteracão das suas qualidades culinárias durante o armazenamento. **(Beans from Angola. Alterations in their culinary qualities during storage.)**
Estud., Ensaios Docum., Junta Invest. Ultramar **63**, 1959, pp. 125, bibl. 29, illus., from *Trop. Abstr.*, 1960, **15**, Abstr. h2959.

Laboratory storage experiments indicated that the moisture content of beans intended for storage or CS_2 fumigation should not exceed 13%.

2436. Strachan, G.
A device for the measurement of bean toughness.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, pp. 22-3.

Consisting of a modified household electrical meat grinder, incorporating a recording millivoltmeter to obtain the mean power required for grinding.—Lethbridge Res. Stat., Alberta.

2437. Sinha, R. C.
Some effects of temperature and of virus inhibitors on infection of french-bean leaves by red clover mottle virus.
Ann. appl. Biol., 1960, **48**: 749-55, bibl. 11.

Keeping the plants before inoculation at 36, 32 or 28° C. for 1–2 days increased their susceptibility to infection, but longer exposures to 36 and 32° C. decreased susceptibility. Susceptibility increased most rapidly at 36° C. The number of infections was unaffected by changes in post-inoculation temperatures between 12 and 24° C., but decreased at temperatures above 24° C. Thiouracil inhibited infection slightly but neither it nor azaguanine affected the rate of multiplication of the virus in the plant. Trichothecin inhibited infection and interfered with virus accumulation, but it also caused macroscopic injury to the leaves; washing the leaves within 1 hr. after inoculation prevented both inhibition and leaf damage. Virus multiplication was not resumed when leaves were transferred from trichothecin solutions to water. [From author's abstract.]—Rothamsted exp. Stat., Herts.

2438. Yerkes, W. D., Jr.
Interaction of potassium gibberellate and a stunting bean virus on beans, *Phaseolus vulgaris*.
Phytopathology, 1960, **50**: 525-7, bibl. 5, illus.

In the variety Bayo 158 50 p.p.m. of potassium gibberellate stimulated internode lengthening almost immediately. The virus known as Mexican severe bean mosaic slowed growth considerably, taking effect several days after inoculation and almost stopping growth during the second week following inoculation. Potassium gibberellate only slightly stimulated plants previously infected with the virus, and its effect was almost completely counteracted by subsequent inoculations of the virus.—Rockefeller Found., N.Y.

2439. Messiaen, C. M.
Moyens de lutte contre l'anthracnose du haricot. **(Methods of controlling anthracnose in beans.)**
Phytiat.-Phytopharm., Paris, 1960, **9**: 191-5.

The best control was achieved by spraying with 1kg. of thiram per hl. at the 2-leaf stage, followed by applications of 300 g. per hl. at the flower bud stage and during flowering. The 2-leaf stage was the most important for control.—Stat. Path. vég. Sud-Est, Montfavet.

2440. Hyre, R. A.
New aids for forecasting downy mildew of lima bean.
From abstr. in *Phytopathology*, 1960, **50**: 572.

To supplement the standard method based on rainfall and temperature data, especially for later-season spread, other forecast aids for *Phytophthora phaseoli* were investigated. These were based on temperature and relative humidity or dew. Calculated disease-severity values varied with the presence of dew or a relative humidity of 90% or more for 10 to over 25 hours, and depended on a concurrent mean temperature of between 45° and 80° F. and on the maximum temperature the following day. Positive correlation with disease spread was better when the limiting maximum temperature the following day was 85° rather than 90° or 95°. The same relationship held for "Beaumont" infection periods. These were considered to have occurred when the relative humidity was 75% or more for 48 consecutive hours or more. In 1959 the new aids verified the standard method but were no improvement on it.

2441. Maier, C. R.
Effect of certain crop residues on bean root-rot pathogens.
Plant Dis. Reptr, 1959, **43**: 1027-30, bibl. 4.

The effects of several crop residues on the relative populations of various root rots were studied in pot experiments, using pinto beans as the test plant. When mixed inoculum was used, finely-ground residues resulted in less severe root rot than did coarsely-chopped residues, and mature or dry residues resulted in less severe rot than did green residues. Root rot severity with *Fusarium* as an inoculum was increased by alfalfa, sesbania and tomato, and was decreased by barley, sorghum and maize. With *Rhizoctonia* the severity of root rot was increased by lettuce and tomato, and reduced by soya bean, sorghum, sesame, alfalfa and barley. With *Thielaviopsis* root rot increased with cotton, maize, sesame, lettuce, alfalfa, sesbania and sudan grass residues. Root rot caused by mixed inoculum was increased by alfalfa, sesbania and lettuce, and reduced by soya bean, barley, sorghum and sudan grass.—N. Mex. agric. Exp. Stat., University Park.

2442. Papavizas, G. C., and Davey, C. B.
Rhizoctonia disease of bean as affected by decomposing green plant materials and associated microfloras.
Phytopathology, 1960, **50**: 516-22, bibl. 24, illus.

For an earlier account see *H.A.*, 30: 676.

2443. Davey, C. B., and Papavizas, G. C.
Effect of dry mature plant materials and nitrogen on *Rhizoctonia solani* in soil.
Phytopathology, 1960, **50**: 522-5, bibl. 18.

Four plant materials (amendments) and 2 forms of supplementary N were incorporated in soil naturally infected with *Rhizoctonia solani*. The amendments, soya beans, maize, oats and sawdust, were added at the rate of 1% of the oven-dry weight of soil. Ammonium nitrate and Uramite were added to provide 100 p.p.m. N in the soil. After a fallow period of 4 weeks susceptible snap beans were planted. Soya beans, maize and oats were more effective in reducing the disease than sawdust. Both forms of N increased the effectiveness of all the amendments except soya beans, and they also effectively reduced the disease when applied alone. —U.S.D.A., Beltsville, Md.

2444. Rackham, R. L., and Vaughn, J. R.
The effects of gibberellin and fungicides on bean root rot.
Plant Dis. Reptr, 1959, **43**: 1023-6, bibl. 5, illus.

Seven fungicides tested alone did not control root rot of beans (*Fusarium solani* f. *phaseoli*). However, certain fungicidal treatments were effective in combination with gibberellin, when applied as a spray on the primary leaves or in talc to the seed coat. In general, the higher spray concentrations of gibberellin slightly increased pod set and foliage and vine growth, and reduced disease, as compared with plants sprayed with lower concentrations or those grown from coated seeds. Plants sprayed with gibberellin, but with no fungicidal treatment, showed slightly higher root-rot indexes than did the inoculated control plants.—Wyo. agric. Exp. Stat., Laramie.

2445. Bateman, D. F.
The influence of pH on growth of *Thielaviopsis basicola* in culture and the development of *Thielaviopsis* root rots of poinsettia and bean in soil.
From abstr. in *Phytopathology*, 1960, **50**: 628.

At temperatures optimal for disease development (18–20° C.) both poinsettia and bean escaped severe infection in soils of pH 5·5 or lower, but roots of plants in soils of a higher pH were destroyed within 2 weeks. Bean was equally susceptible in soils of pH 4·7, 5·8, 7·0 and 8·0 when the normal soil flora was eliminated and aseptic conditions were maintained; in sterile sand culture disease was most severe under acid conditions. One month after the addition of *Thielaviopsis* to non-sterile soils in the absence of a host, less than $\frac{1}{10}$th of the original *Thielaviopsis* population was detected when the pH was 4·7; however, no decrease in fungus concentration was apparent in soil of pH 8·0.

2446. Braithwaite, B. M.
Bean blossom thrips.
Banana Bull., 1960, 23(7): 7.

Dieldrin or parathion applied just as the flowers were opening gave the best control.

2447. Ueki, K., and Igawa, M.
The ecological difference in broad bean varieties as shown by high temperatures by day and by night. [Japanese, with English summary ½ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **10**: 112-20, bibl. 18, illus.

Seedlings were subjected to high temperature during day and night, during the night only, during the day only or not at all (control). Stem and leaf growth was increased by high temperature treatment, the combined day and night treatment giving the largest response and night treatment only a very slight increase. High temperature treatment decreased the period from germination to flowering but prolonged the period of flowering, the combined day and night treatment again giving the greatest response. More flowers were produced under high temperatures but a smaller percentage of them set fruit.

2448. Ueki, K., and Inokuti, A.
After-effect of high temperature treatment given during the seed ripening period of broad bean on the plant growth and yield in the following generation. [Japanese, with English summary ⅓ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 281-5, bibl. 9, illus.

Maturing broad bean plants were subjected to 4 treatments, viz., (*a*) high day and night temperatures, (*b*) high day temperature, (*c*) high night temperature and (*d*) control. These treatments were reflected in the behaviour of the next generation as regards plant height, numbers of leaves and branches, length of time from germination to flowering, blooming period, number of flowers, fruiting period and weight and number of seeds. There were differences in the response of different varieties, which may help to explain why some varieties succeed better in some districts and other varieties in other districts.

2449. Davidson, D.
Meristem initial cells in irradiated roots of *Vicia faba*.
Ann. Bot., Lond., 1960, **24**: 287-95, bibl. 17, illus.

Seeds which had been allowed to grow for 24 hours were irradiated with X-rays and then allowed to grow for a further 9, 11 and 21 days. Subsequent histological examination showed that there were at least 32 actual meristem initial cells in each regenerated irradiated primary root.

2450. Lahiri, A. N., and Audus, L. J.
Growth substances in the roots of *Vicia faba*.
J. exp. Bot., 1960, **11**: 341-50, bibl. 7.

Growth substances from seedling roots separated chromatographically and bioassayed.

2451. Tamaki, K., and Naka, J.
Physiological studies on the growth of broad bean plants. I. On the variations of chemical components in various organs of the tops during the growing period. [Japanese, with English summary ⅓ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 13-18, bibl. 31.

In trials with the variety Sanuki-Nagsaya the carbohydrate and N contents of the leaves increased after flowering, whereas those of the stems and pods decreased rapidly after reaching a maximum at the flowering stage. The starch and N contents of the seeds were high at this time but the sugars decreased. It was concluded that the stems and pods acted as temporary storage organs for the seeds.

2452. Narasaki, T.
Anthrone reaction of the unidentified sugar in a hemicellulose from broad-bean seeds. [English, with Japanese summary ⅓ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 265-9, bibl. 16.

Characteristic reactions of rhamnose.

2453. Deverall, B. J.
Phenolase and pectic enzyme activity in the chocolate spot disease of beans.
Nature, 1961, **189**: 311, bibl. 3.

Experiments are described which showed that the formation of a dark brown spot by *Botrytis fabae* on broad beans is caused by the interaction of the polygalacturonase systems of the fungus and the phenolase systems of the host, the death of the host cells liberating the phenolase system. This is followed by oxidation of the host phenols and the formation of dark brown polymeric products which, in turn, inactivate the polygalacturonase of the fungus and thus limit the development of the chocolate spots.—Imp. Coll. Sci. Technol., London.

2454. Subramaniam, A., and Premsekhar, S.
Seed production in guar (cluster beans), *Cyamopsis psoraloides*.
Madras agric. J., 1960, **47**: 134-5, bibl. 5.

In trials of 10 high yielding varieties, which were given 3 irrigations and harvested 4 months after sowing, C.P.78 gave the highest yield of 600 lb. seed/acre and was best for seed production. Ordinary types showed a high seed : pod ratio (49·6–54·9%) and fleshy types a low ratio (37·9–42·1%). Pusa Mousmi produced the best quality pods.

Legumes—peas.

(*See also* 1696, 1711, 1716, 1718, 1719, 1752, 1756. 1760, 1764, 1765, 1768-1770, 1772, 1774, 1779, 1781, 1785, 1790, 1798, 1831, 2318, 2322, 2338, 2608, 3565, 3614.)

2455. Jensen, J.
Sortsforsøg med høje aerter. 1956-58. **(Variety trials with tall peas, 1956-58.)**
Tidsskr. Planteavl, 1960, **64**: 515-25, illus.

Observations on growth and yields of 14 varieties, with varietal descriptions.

2456. Yen, D. E., and Casey, R. J.
Wilt-resistant Onward peas.
N.Z. J. Agric., 1960, **101**: 565-6, bibl. 4, illus.

The breeding of 6 wilt-resistant lines obtained by crossing Onward with Delwiche Commando, which is resistant to Fusarium wilt, and back crossing to Onward, is reported [see also *H.A.*, 30: 2230]. No differences were observed between these lines and Onward in growth, flowering, maturation of pods, ease of harvesting or seed characters, and all the new lines produced higher yields.—D.S.I.R., Otahuhu and Lincoln, N.Z.

2457. Barker, G. R., and Douglas, T.
Function of ribonuclease in germinating peas.
Nature, 1960, **188**: 943-4, bibl. 6.

Ribonuclease activity and the percentages of ribonucleic acid and of protein were measured in the cotyledons and in the roots and shoots of germinating peas. In the cotyledons the RNA content and the ribonuclease activity ran approximately parallel, but in the root and shoot ribonuclease activity preceded an increase in RNA content, thus suggesting a synthetic function for the enzyme.—Manchester Univ.

2458. Zueva, E. S., and Proskurjakov, N. I.
Glutathione reductase and systine reductase in germinating and ripening pea seeds. [Russian, with English summary 6 lines.]
Biohimija, 1960, **25**: 897-900, bibl. 13.

An increase in the activity of these 2 reductases was noted on the 5th or 6th day of an 8-day germination period and a marked decrease on the last day. No activity was found in the earlier stage of seed ripening, but it appeared later and increased to a maximum at maturity.—State Univ., Moscow.

2459. Kumar, S., and Saxena, H. C.
Preliminary studies on the effect of certain antibiotics on the seedlings of *Pisum sativum* Linn.
Sci. and Cult., 1960, **26**: 128-9, bibl. 4, illus.

One-week-old pea seedlings in sand culture were irrigated with 7 antibiotics at concentrations of 200 p.p.m., and the effects observed 15 days later. Average height was increased by all except chloromycetin and most of all by aureomycin. Fresh weight also was greatest with aureomycin and least with chloromycetin. The highest dry matter content occurred in the chloromycetin treatment, the lowest in the controls. Aureomycin, bacitracin and penicillin improved root development, but chloromycetin and oleandomycin reduced it.—Rajasthan Coll. Agric., Udaipur.

2460. Maciejewska-Potapczykowa, W., and Łukasiak, H.
Wpływ kinetyny na zawartość węglowodanów w epikotylach grochu. **(The influence of kinetin on the carbohydrate content of pea epicotyls.)** [English summary.]
Acta Soc. Bot. Polon., 1959, **28**(1): 95-110, from *Biol. Abstr.*, *Sect. D*, 1960, **35**, Abstr. 30,086.

Kinetin and a kinetin-IAA mixture increased the polysaccharide content of pea epicotyls at the expense of mono- and di-saccharides. Adenine markedly increased the starch content.

2461. Hashimoto, T.
Effects of light on the indoleacetic acid-induced growth of *Pisum* plant.
Sci. Paps Coll. gen. Educ. Tokyo Biol., 1959, **9**: 235-54, from *Biol. Abstr.*, *Sect. D*, 1960, **35**, Abstr. 64,270.

IAA applied to Alaska peas accelerated elongation of stem, petiole and tendril segments and expansion of leaf and stipule discs, but did not enlarge the root. The acceleration of IAA-induced growth by light was observed in green excised segments of stem, petiole and tendril and in green leaf and stipule discs, but not in etiolated stem and root segments. This light effect was greatest in the absence of sugar, and the light effect could almost be replaced by the addition of sugar. Elongation of green stem segments increased with increasing light intensity, reaching a maximum at 10,000 lux; half the maximum elongation was found at 2,000 lux. Elimination of CO_2 from the surrounding air diminished the growth response to light; air with 5% CO_2 had no effect on it. In the intact plant the petioles, tendrils and leaves, but not the stem, grew markedly in light. Excised stem, petiole and tendril segments showed an almost equal growth rate to that of an intact plant in the dark, and the leaf disc exhibited much larger expansion than an attached leaf under the same conditions of light and temperature.

2462. Teas, H. J., and Holmsen, T. W.
Inhibition of geotropism in corn and pea shoots by gamma radiation.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxiv.

Doses of from 20 to 640 kr. markedly inhibited geotropic responses.

2463. Shewfelt, A. L., and Hyde, R. B.
Rate of maturation of peas.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 22.

The variety Alaska was observed to mature more rapidly than Earligreen, although both had similar heat requirements between planting and harvest.—Morden Res. Stat., Manitoba.

2464. Hope, G. W.
Improved prediction of harvest date by heat unit summation.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 21.

Data obtained in 4 years of experimental growing of Perfection peas showed that total heat sums derived from diurnal means gave less variation than those from maxima. The coefficient of variance was reduced by selecting maximum and minimum temperature levels, above and below which the heat was ignored. The lowest coefficient of variance was obtained from diurnal means with a maximum level of 60° and a minimum level of 36° F.—Kentville Res. Stat., N.S.

2465. Lockhart, J. A., and Gottschall, V.
Senescence in the Alaska pea.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xx.

In the Alaska pea senescence is normally induced by fruit development, but when regular deflowering was practised vegetative growth continued only for a limited period before senescence occurred.—Calif. Inst. Tech., Pasadena.

2466. Miller, J. H.
The effect of growth conditions and the stage of leaf development on the Hill reaction in homogenates of *Pisum sativum* leaves.
Amer. J. Bot., 1960, **47**: 532-40, bibl. 22.

With plants grown under short-day conditions (8 hr. light and 16 hr. dark), crude chloroplast suspensions from young leaves have a higher Hill-reaction activity between 1 and 3 hr. after the beginning of illumination than suspensions from older leaves, while after 5–7 hr. of illumination this activity difference is not found. These differences result from a marked diurnal rise and fall in the Hill reaction. The magnitude of the rise depends on the age of the leaf from which the chloroplast suspension is prepared. Peak activity occurs after the plants have received between 3 and 4 hr. of light and is highest in suspensions prepared from young leaves. Suspensions from the oldest leaves show no diurnal change in activity. [From author's abstract.]—Yale Univ., New Haven, Conn.

2467. Linck, A. J., and Sudia, T. W.
Transport specificity of C^{14} to the fruit of *Pisum*.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): iii.

Plants of *Pisum sativum* var. Alaska were allowed to photosynthesize $C^{14}O_2$ supplied to the first bloom node leaf for 3 hr. at 800 f.c. light intensity and 27° C. temperature. At the end of this time more than 90% of the radioactivity was found in the fruit. Most of the activity was found to be in sucrose in the supply leaf, in the carpel and in the ovules.—Univ. Minnesota, St. Paul.

2468. Laughlin, J. C.
Fertilizer placement with green peas in Tasmania.
Tasm. J. Agric., 1960, **31**: 198-205, bibl. 11, illus.

In 2 trials yields of Victory Freezer peas produced by side-band placement and pre-drilling were similar, and both were significantly higher than those produced by broadcasting [see also *H.A.*, 29: 3629]. A serious reduction in germination occurred when N and K fertilizers were sown in contact with the seed. Sulphate of ammonia, 2½ cwt./acre, reduced germination by 34%, and potash, 2½ cwt./acre, by 19%. A higher yield per plant was obtained with wider spacing (14 in.), but a higher yield per acre with narrower spacing (7 in.).

2469. Scheffer, F., Kloke, A., and Ofori, C. S.
Chromatographische Untersuchungen über den Einfluss von Kalium- und Phosphat-Düngung auf den Gehalt von einigen Aminosäuren in Erbsen. (**Chromatographic investigations on the influence of potassium and phosphate fertilization on the amounts of several amino acids in peas.**) [English and French summaries ½ p. each.]
Qual. Plant. Mater. veg., 1960, **7**: 329-40, bibl. 10.

Both P and P + K increased the yield and protein content of peas, but no correlation was found between the amino acid composition of the protein and the fertilizers applied.—Univ. Göttingen.

2470. Plarre, W.
Die Wirkung verschiedener Beizmittel bei der weissen Lupine (*Lupinus albus*), Gemüseerbse (*Pisum sativum*) und Buschbohne (*Phaseolus vulgaris*). (**The effect of seed treatment with various chemicals on white lupin, pea and bean.**) [Russian and English summaries 19 lines each.]
NachrBl. dtsch. PflSchDienst, Berlin, 1960, **14**: 121-9, bibl. 9.

With marrow-fat peas and kidney beans seed treatment with "Cerenox spezial" and captan proved superior to that with the purely mercurial compound Germisan. Under most conditions Atiram (TMTD) also gave very satisfactory results.—ForschStelle Getreidezücht. Kloster Hadmersleben, Berlin.

2471. Nath, J.
Studies of soil fumigation with Vapam for controlling soil borne diseases of peas.
Thesis Summary in *J. Aust. Inst. agric. Sci.*, 1960, **26**: 289-90.

Vapam 4-S, applied at 1,000 lb./acre, eliminated many fungal species including pathogens causing soil sickness of peas.

2472. Haglund, W. A., and King, T. H.
The effect of nematodes on the development of root rot and yield of canning peas.
Plant Dis. Reptr, 1959, **43**: 787-90, bibl. 5.

Soil fumigation with Dowfume MC-2, Dorlone or Telone before sowing canning peas reduced nematode populations. Dowfume MC-2 was the only material to control root rot [*Aphanomyces* spp.]. Yields of peas in all the treated plots were greater than those in untreated plots.—Univ. Minn., St. Paul.

2473. Lockwood, J. L.
Pea introductions with partial resistance to *Aphanomyces* root rot.
Phytopathology, 1960, **50**: 621-4, bibl. 2.

Several introductions gave consistently lower disease indices than commercial varieties [see also *H.A.*, 31: 711].

2474. Walker, J.
Mycosphaerella blight of peas.
Banana Bull., 1960, **23**(5): 7.

Recommended control measures include rotation, sanitation and seed treatment with fungicides.

2475. Gray, E. G., and Findlater, W. T.
***Sclerotinia sclerotiorum* on peas in Kincardineshire.**
Plant Path., 1960, **9**: 130-2, bibl. 11, illus.

The first record of the disease in Great Britain. Where the attack was severe one-third of the plants were killed and the yield was reduced from 40 to 13 cwt. per acre.—N. Scot. Coll. Agric., Aberdeen.

2476. Auclair, J. L., and Cartier, J. J.
Effets comparés de jeûnes intermittents et de périodes équivalentes de subsistance sur des variétés résistantes ou sensibles de pois, *Pisum sativum* L., sur la croissance, la reproduction et l'excrétion du puceron du pois, *Acyrthosiphon pisum* (Harr.) (Homoptères: Aphidides). **(Comparative effects of fasting periods and of rearing periods on resistant and susceptible pea varieties on the growth, reproduction and excretion of the pea aphid.)** [English summary $\frac{1}{3}$ p.]
Ent. exp. appl., 1960, **3**: 315-26, bibl. 11.

A more detailed version of work reported in *H.A.*, 31: 715.

2477. Franssen, C. J. H.
Levenswijze en bestrijdingsmogelijkheden van de erwtetrips (*Kakothrips robustus* (Uzel). **(Life history and control of the pea thrips.)** [English summary 1 p.]
Versl. LandbK. Onderz. **66.4**, 1960, pp. 36, bibl. 71, illus., reprinted as *Meded. Inst. PlZiekt. Onderz. Wageningen* **219**.

A fuller version of work reported in *H.A.*, 29: 1448.

2478. Legowski, T. J., and Gould, H. J.
Losses of dry harvesting peas due to pea moth in East Anglia and the economics of control measures.
Plant Path., 1960, **9**: 119-26, bibl. 2.

From 1957 to 1959 losses amounted to about £100,000 each year. This was equivalent to the total production from 2,000 acres or 10% of the total crop. The economics of applying one and two sprays are discussed. It is estimated that one spray is unlikely to give more than 50% control, and that in 53% of the fields sampled spraying probably paid for itself.—N.A.A.S., Cambridge.

2479. King, D. L., and Riddolls, A. W.
Damage to wheat seed and pea seed in threshing. [French and German summaries $\frac{1}{4}$ p. each.]
J. agric. Engng Res., 1960, **5**: 387-98.

Trials were made of the effect of different combinations of drum speed and concave clearance on damage to pea seed when threshed with a combine-harvester at fairly low moisture content. Measurements were made of visible damage and of invisible damage as indicated by loss of germination. The results showed that high drum speeds were the chief factor in causing visible damage. The combined effect of visible and invisible damage, referred to as "wastage", followed a similar trend to visible damage, reaching very high levels at high speed, particularly at very close concave clearances. [From authors' abstract.]—Canterbury agric. Coll., Lincoln, N.Z.

Lettuce and other salad crops.

(*See also* 1699, 1702, 1722, 1730, 1769, 1771, 1787, 1792, 1832, 1867, 2321, 2325, 2330, 2343, 2348, 3566, 3573.)

2480. Blumenthal-Goldschmidt, S.
Changes in the content of germination regulating substances in lettuce seeds during imbibition.
Bull. Res. Coun. Israel, Sect. D, 1960, **9D**: 93-9, bibl. 28.

Lettuce seeds of the variety Grand Rapids were investigated for their content of germination regulating substances. The dry seeds were shown to contain only germination inhibitors, but during germination these inhibitors disappeared and other germination inhibitors and germination stimulators appeared. Thiourea and coumarin were shown to affect the pattern of germination regulating substances during germination. [Author's abstract.]—Hebrew Univ., Jerusalem.

2481. Ikuma, H., and Thimann, K. V.
Action of gibberellic acid on lettuce seed germination.
Plant Physiol., 1960, **35**: 557-66, bibl. 30.

The work was carried out by shaking the seeds directly with a GA_3 solution or water throughout the period of imbibition and germination. During the course of imbibition the seeds gradually become sensitive to red light, and reach their maximum sensitivity 1¼ hours after the beginning of imbibition when water uptake is still not complete; thereafter the sensitivity to red light gradually decreases. In seeds which have been induced to germinate by red light, the inhibitory effect of far-red light gradually decreases with an increasing time interval between the red and far-red treatments. Far-red light no longer inhibits the germination process after the first sign of visible germination occurs (8–9 hrs. after red light treatment at 25° C.). GA at 60 p.p.m. induces maximal germination; germination is almost linearly proportional to concentration below this level. However, if the solution is injected directly into the seed, concentrations as low as 1 p.p.m. are fully effective. The action of GA is not to control the initial rate of growth of the hypocotyl and the root, since this rate is increased only at about 16 hours after the first sign of visible germination. The time of greatest sensitivity for the induction of germination by GA occurs after about 1¼ hours of pre-soaking in water; this timing is identical with the most sensitive period of the seeds to red light. Far-red light does not inhibit the germination of seeds which have been treated with GA so as to produce 90% germination. If the time of GA treatment is adjusted to give only 50% germination, and the far-red exposure increased, then far-red does partially inhibit, but this inhibition is exerted to the same extent whether the exposure is made before or after the GA is applied. Thus, heavy doses of far-red desensitize the seeds to GA. Repeated attempts to detect a gibberellin as the end-product of the action of light in the seeds failed completely. It is deduced that GA acts by initiating one of the chemical reactions which result from the light reaction, so that its end product is the same as that produced by light. [From authors' summary.]—Harvard Univ., Cambridge, Mass.

2482. SIMÃO, S.
Influência do ácido giberélico sôbre a alface. **(The influence of gibberellic acid on lettuce.)**
Rural, Rev. Soc. rural Bras., 1960, **40**(471): 22-4, bibl. 8, illus., from *Trop. Abstr.*, 1960, **15**, Abstr. h2846.

Responses to 1 p.p.m. GA in summer and winter differed considerably.

2483. MOHR, H., AND NOBLÉ, A.
Die Steuerung der Schliessung und Öffnung des Plumula-Hakens bei Keimlingen von *Lactuca sativa* durch sichtbare Strahlung. **(Regulating the closing and opening of the plumular hook in lettuce seedlings by means of visible radiation.)** [English summary ½ p.]
Planta, 1960, **55**: 327-42, bibl. 18, illus.

By the reversible red, far-red system and the blue, far-red system, respectively.

2484. MOHR, H., AND WEHRUNG, M.
Die Steuerung des Hypokotylwachstums bei den Keimlingen von *Lactuca sativa* L. durch sichtbare Strahlung. **(Regulating the hypocotyl growth in lettuce seedlings by means of visible radiation.)**
Planta, 1960, **55**: 438-50, bibl. 24.

Hypocotyl lengthening in lettuce seedlings under the "reversible red, far-red system" is negligible, whereas white, blue and far-red light strongly inhibit it. It was shown that control of hypocotyl growth is by the "blue, far-red reaction system".—Univ. Tübingen.

2485. BORRIES, F. B., JR.
Lettuce grown—no heat cost.
Ky Fm Home Sci., 1959, **5**(2): 6-7.

The use of 2 sheets of ¾-mil. thick plastic, 18 in. above the ground inside an unheated plastic greenhouse resulted in a temperature of 38° F., whilst the outside temperature was only 3° F. Solar heat produced initial warmth and heat filtered through soil which had been compacted by watering. A marketable lettuce crop was produced under the double sheet of plastic, but browning occurred under a single layer.

2486. BORRIES, F. B., JR.
Use of fan and mist-nozzles increases lettuce yields.
Ky Fm Home Sci., 1959, **5**(4): 6-7, illus.

The use of several mist-nozzles in a plastic greenhouse, arranged above a large fan and a baffle plate to deflect the mist downwards, doubled the yield and size of lettuces. At 90–100% R.H. no diseases developed.

2487. KURKI, L.
Kasvukauden lämpöolot ja rapea keräsalaatti. **(Growing temperatures and crisp head lettuce.)** [English summary ¼ p.]
Maatalous ja Koetoim., 1960, **14**: 156-62, bibl. 4, illus.

Great Lakes, Cornell 456 and Pennlake grew satisfactorily in 3 Finnish summers. Imperial 101 bolted in 2 seasons after periods of high temperature.—Univ. Helsinki.

2488. MIYAZAKI, Y.
On the physiological changes during the growth of head lettuce, *Lactuca sativa* var. *capitata*. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 142-6, bibl. 3.

During the early growth period the moisture content of the lower leaves was greater than that of the upper leaves, but the reverse was true during heading. The change-over occurred on 3 June, which could be regarded as the date on which heading started.

2489. FINLEY, A. M.
Drought spot of lettuce cotyledons.
Plant Dis. Reptr, 1959, **43**: 629-32, bibl. 1, illus.

Studies have led to the conclusion that cotyledonary spotting, which develops on lettuce raised from seed produced in Idaho, is a manifestation of physiological drought. The tissues of developing lettuce embryos may become desiccated under a moisture stress resulting from maximum daily temperatures above 90° F. combined with low available soil moisture.—Univ. Idaho.

2490. MARLATT, R. B.
The effects of applications of micro-nutrients to Arizona field-grown lettuce.
Plant Dis. Reptr, 1959, **43**: 1019-22, bibl. 21.

Head weights were reduced by soil applications of 1,000 lb./acre of calcium oxide and by 200 lb./acre of Ca-EDTA. Foliar sprays of 4·8 g. magnesium sulphate in 2 gal. water applied weekly after thinning significantly decreased rib-discoloration disease. Magnesium EDTA (10 and 15 lb./acre) increased head weights significantly. Iron EDTA sprays containing 2 lb./100 gal. burned lettuce heads. Manganese EDTA (2 lb./100 gal.) significantly reduced head size and rib discoloration. Applications of 1,000 p.p.m. cobalt chloride also decreased rib discoloration significantly. Early yields were significantly increased by weekly sprays containing 323 or 969 p.p.m. zinc sulphate or 1,650 p.p.m. zineb. A side dressing of 100 lb./acre zinc sulphate also significantly increased early yields. Some plants were killed by weekly sprays of ZnEDTA at 4 lb./100 gal., and yields were reduced by 2 lb./100 gal. Side dressing with ZnEDTA at 200 lb./acre or zinc sulphate at 1,000 lb./acre also reduced lettuce stands. [From author's abstract.] —Ariz. agric. Exp. Stat., Tucson.

2491. Hoff, J. K., and Newhall, A. G.
Corky root rot of Iceberg lettuce on the mucklands of New York.
Plant Dis. Reptr, 1960, **44**: 333-9, bibl. 9, illus.

Corky rot, previously called *Pythium* stunt, of head lettuce has been reproduced in sand culture and in steamed muck soil by an excess of ammonium N, but not by *Pythium* or other fungi isolated from diseased roots. Severity was less with pH values above 5·5. Cox lettuces are resistant.—Cornell. Univ.

2492. Rich, S.
Terraclor controls *Olpidium* on lettuce.
Plant Dis. Reptr, 1960, **44**: 352-3, bibl. 5.

In greenhouse pot trials Terraclor 75% mixed dry with sand at 50 p.p.m. completely protected lettuce seedlings against *Olpidium brassicae*.—Conn. agric. Exp. Stat., New Haven.

2493. Dunn, J. A.
Varietal resistance of lettuce to attack by the lettuce root aphid, *Pemphigus bursarius* (L.).
Ann. appl. Biol., 1960, **48**: 764-70, bibl. 5, illus.

It was found that White Favourite and Imperials E-4 and 19551-M are highly resistant; Imperial 45634-M, Continuity and Iceberg are markedly resistant. Midas, Salad Bowl and Imperial 4164 each appear to be a mixture of susceptible and resistant plants. Immigrant winged forms of *P. bursarius* showed no preference for colonizing any particular variety of lettuce, and it seems that resistance to attack results from antibiosis. [From author's abstract.]—Nat. Veg. Res. Stat., Wellesbourne.

2494. Dunn, J. A.
The use of endrin and other insecticides against lettuce root aphid, *Pemphigus bursarius* L.
Ann. appl. Biol., 1960, **48**: 314-22, bibl. 3.

As a seed dressing endrin dust gave inconsistent results, but when supplemented by an endrin spray control was good. Diazinon spraying also gave good control, as did diazinon or endrin at 4 lb./acre rotovated in before sowing. The persistence of endrin residues is not yet known.—Nat. Veg. Res. Stat., Wellesbourne.

2495. Dunn, J. A.
The natural enemies of the lettuce root aphid, *Pemphigus bursarius* (L.).
Bull. ent. Res., 1960, **51**: 271-8, bibl. 10.

2496. Plumier, W.
Le forçage expérimental de la chicorée-witloof. **(Experimental forcing of witloof chicory.)**
Bull. hort., Liège, 1960, **15**: 315-17, illus.

A forcing installation which uses water as a heat source has been constructed. The water, electrically heated under thermostatic control, is circulated through a number of troughs by means of a pump. The chicory roots are placed in soil in large glazed earthenware pots which stand in the water trough. The water makes one complete circuit every half-hour and its temperature does not fluctuate by more than 1° C. Using this installation forcing trials were carried out over 2 years with water temperatures of 18°, 20° and 22° C. following pre-forcing treatment at 9° and 12° C. The 18° C. forcing temperature produced the best quality chicory.—Stat. Amél. Plantes fruit. maraîch., Grand-Manil.

2497. Spire, D.
Influence des conditions de milieu sur le développement de la maladie des taches jaunes du cresson (*Nasturtium officinale* R. Br.). **(The effect of environmental conditions on the development of the yellow spot disease of watercress.)**
C.R. Acad. Agric. Fr., 1960, **46**: 505-7, bibl. 3.

This disease, which made its appearance in France some years ago, manifests itself immediately after the first October frost as bright yellow ringspots which distort the foliage and render the watercress unmarketable. Cold favours the virus, and experiments have shown that covering watercress beds with PVC film raises the temperature of air and water sufficiently to render the plants healthy carriers, either preventing symptoms from appearing or causing their disappearance in 10–12 days.

2498. Anon.
Handling of watercress.
World Crops, 1960, **12**: 431, illus.

In a new watercress packing station at Alresford, Hampshire, England, watercress is washed, trimmed, bunched and packed in baskets, then hydrocooled and mechanically lifted and conveyed to the cold store.

Mushrooms.

(*See also* 3573, 3580.)

2499. Kneebone, L. R., and Allison, W. H.
Mushroom yield not affected by initial pH of compost or casing layer.
Science for the Farmer, 1960, **8**(1): 11.

Determinations of pH at the time of spawning, casing and at each successive break of mushrooms showed that the normal trend of the compost pH was from 7·4, following pasteurization at spawning, to 6·3 at casing and to 6·0 at picking, regardless of differences in the initial pH values obtained by additives and of the pH and type of casing material used.

2500. GANDY, D. G.
A transmissible disease of cultivated mushrooms ("watery stipe").
Ann. appl. Biol., 1960, **48**: 427-30, bibl. 2.

The disease and experiments on its transmission are described; its cause is still uncertain.

2501. WYATT, I. J.
Cecidomyiidae as pests of cultivated mushrooms.
Ann. appl. Biol., 1960, **48**: 430-2, bibl. 3.

The behaviour of the pests, mainly *Heteropeza pygmaea*, and the damage caused are described. Promising control measures include mixing insecticides with the compost, although this reduces yield, or with the casing soil [see also next abstract].

2502. HUSSEY, N. W., WYATT, I. J., AND HUGHES, J. T.
Insecticidal control of paedogenetic cecid larvae in mushroom beds. I. Incorporation of insecticides into compost.
HUSSEY, N. W., AND WYATT, I. J.
Idem. II. Incorporation of insecticides in the casing layer.
Ann. appl. Biol., 1960, **48**: 336-46, bibl. 10, and 347-51, bibl. 2.

I. γ-BHC, incorporated at 50 p.p.m. in mushroom compost during the last turn of composting, delayed the reproduction of paedogenetic cecid larvae [*Heteropeza pygmaea*, *Mycophila speyeri* and *M. barnesi*] without reducing the yield of mushrooms [see also *H.A.*, 29: 1471]. Other insecticides were less satisfactory, as they either did not control the larvae, were not sufficiently persistent or decreased the yield. Large cecid populations did not depress yields on normal composts but a proportion of the larvae migrated on to the sporophores, thus reducing the value of the crop. II. Aldrin and γ-BHC, at concentrations above 10 p.p.m., were shown to be promising materials in experiments on the prevention of sporophore contamination by cecid larvae, following the incorporation of insecticides in the casing before its application to the beds. [Authors' abstracts.] —Glasshouse Crops Res. Inst., Littlehampton.

2503. BAKER, K. F., AND MATKIN, O. A.
An unusual occurrence of morels in cultivated beds of cymbidiums.
Plant Dis. Reptr, 1959, **43**: 1032-3, bibl. 18.

Morels (*Morchella* spp.) developed profusely on newly-planted raised beds of cymbidiums. The orchids were growing in a medium of slightly charred, ground bark of *Abies concolor*, and it is suggested that such a medium could be used for the commercial culture of morels.—Univ. Calif., Los Angeles, and Soil and Plant Lab., Orange.

2504. STRIGOLI, P.
La coltivazione dei tartufi. **(The growing of truffles.)**
Frutticoltura, 1960, **22**: 555-9, illus.

The growth of truffles (*Tuber magnatum* and *T. melanosporum*) in their natural habitats is described, and information is given on planting an oak wood (with *Quercus pedunculata* or *Q. sessiliflora* in cool, and *Q. ilex* in warm areas) for establishing truffle beds. Production does not begin for 8–10 years, during which time crops such as lavender or other essential-oil plants can be grown between the rows of trees.—Ist. tec. agrar., Bologna.

Onions and related crops.

(*See also* 2318, 2322, 2346, 2678, 2802, 3563, 3566, 3611.)

2505. CAMPOS, F. F., GENEROSO, W. M., AND CAPINPIN, J. M.
Effects of X-ray on the bulbs and seeds of onion (*Allium cepa* L.).
Phillip. Agric., 1960, **44**: 125-33, bibl. 11, illus.

Results obtained from subjecting onion seeds to various levels of X-rays showed that germination was relatively unaffected. X-ray levels between 50 r and 100 r resulted in stimulation of growth in terms of height and fresh weight, the optimum dosage being 75 r. No significant difference in number of leaves was obtained from among the treated lots. The percentage of sprouting of the bulbs was inversely related to X-ray dosage. The sprouting period was relatively unaffected by the different dosages. [From authors' summary.]

2506. CASTRO, M., AND OTHERS.
Effect of variety and spacing on onion yields in Mexico in 1957.
Proc. Carib. Reg. Amer. Soc. hort. Sci. 1958, 1958, **6**: 21.

Total yields of 5 varieties were not significantly different at several row spacings. The highest yields were produced by White Grano, and bulbs grown at 5 cm. apart weighed an average of 125 g., while those grown at 11 cm. weighed 169 g.—Secr. Agric. Ganad., México.

2507. VINCENT, C. L.
Onion seed production in eastern Washington.
Bull. Wash. St. agric. Exp. Stats **612**, 1960, pp. 14, bibl. 11.

In trials in E. Washington seed yields of 700–800 lb. per acre of Yellow Globe Danvers onions have been obtained without irrigation in normal years. Bulbs not less than 1¼ in. in diameter, planted not later than mid-April, are preferred to crops raised from seed, because this method permits some rogueing in the field. Experiments suggest that much higher yields can be obtained with irrigation and by planting mother bulbs over 2 in. in diameter in closely spaced rows (18 in. or less apart compared with 36 in., with row spacing in both cases the width of an average bulb). The percentage germination of the seeds was satisfactory when the crop was harvested when the secondary heads had turned from dark green to green-grey.

2508. Aoba, T.
The influence of the storage temperature for onion bulbs on their seed production. [Japanese, with English summary ¼ p.]
J. hort. Ass. Japan, 1960, **29**: 135-41, bibl. 12, illus.

Storing mother bulbs at or above 20° C., and especially above 30° C., delayed bolting and flowering and reduced seed yields. Cold storage at 0°–5° C. had a similar effect; but at 10° C. flower bud development was accelerated and bolting was earlier. The date of bolting, however, was much more dependent on the date of melting of the snow cover and on growing conditions in the spring than on storage temperature.

2509. Ogata, K., Murata, T., and Tsai, P. L.
Studies on the respiratory mechanism of the onion bulb and its relation to dormancy. [Japanese, with English summary ⅔ p.]
J. hort. Ass. Japan, 1960, **29**: 129-34, bibl. 13.

In Yellow Danvers respiration decreased rapidly in the final stage of bulb development to reach a minimum level, which persisted for some time after harvest, and then rose gradually towards the time of sprouting. This applied both to the disk and to the rest of the bulb. Dehydrogenase activity was low in the dormant period, at which time DNP had little effect on respiration, although it caused a marked rise in oxygen intake when dormancy was breaking. During dormancy moisture had no effect on rooting or sprouting. In early-ripening varieties respiration was lower during ripening and higher during dormancy than in later-ripening strains.

2510. Smith, D. L., and Hiner, L. D.
A comparison of the effects of colchicine and some purified veratrum alkaloids on nuclear division in roots of *Allium cepa* L.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 538-42, bibl. 26, illus.

Concentrations of 0·025 to 0·8% were applied to the root tissue for different periods varying from 3 to 12 hours. Typical colchicine mitotic effects were produced by all the colchicine concentrations. Both Veriloid (a mixture of active principles from *Veratrum viride*) and protoveratrine A also produced frequent chromosomal aberrations, although their appearance suggested a different mode of action from that observed with colchicine.—Univ. Utah, Salt Lake City.

2511. Zimina, T. A., and Krjukova, T. N.
Wild onions (*Allium* spp.) of Sahalin and prospects for their cultivation. [Russian, with English summary 4 lines.]
Bot. Žurnal, 1960, **45**: 844-61, bibl. 8, illus.

Of 3 species studied *Allium schoenoprasum* was the most promising for cultivation both under glass and out of doors. The other species were *A. lineare* and *A. victorialis*.

2512. Choudhury, S. K.
Allyl sulphide content of garlic.
Curr. Sci., 1960, **29**: 351-2, bibl. 5.

In a fertilizer and spacing experiment the allyl sulphide content of garlic was highest when the crop was given 75 lb. per acre of an 18–2–3 NPK mixture plus 5 lb. per acre of a mixture of B, Zn and Mo, and when the plants were spaced 4 in. apart in rows 5 in. apart.—Post-Grad. Basic Training Coll., Agartala.

2513. Corrales M., A.
Empleo de hierbicidas en el cultivo de ajo. **(The use of herbicides in garlic crops.)**
Inf. mens. La Molina, 1959, **33**(388): 1-9.

Karmex W (80% 3-p-chlorophenyl-1-1-dimethyl urea), Preventol (sodium pentachlorophenate) and Bulpur (potassium cyanate) were each applied at 2 rates, 21 and again 51 days after the emergence of the garlic crop. Hand weeding gave the highest yield, but was more costly than any of the above treatments, all of which were economic compared with the unweeded control. From an economic standpoint the 2 best treatments were Karmex W at 1 kg./ha. or hand weeding. Next in order was Preventol at 10 kg./ha. There was some crop injury from 2 kg./ha. of Karmex W.

2514. Adamson, R. M.
The effect on germination of drying leek seed heads at different temperatures.
Canad. J. Plant Sci., 1960, **40**: 666-71, bibl. 2.

The trials described were carried out over 6 years, and the temperatures used included 80°, 95°, 110° and 140° F. and combinations of 80° F. with higher temperatures. In all seasons a continuous temperature of 80° resulted in 65% or higher germination, whereas temperatures of 110° or higher caused lower germination. Treatments of 95° and combinations of 80 and 90° were not significantly different from 80° applied continuously over the period 1953 to 1956, but showed marked trends towards differences in certain years. In 1953 and 1956 germinations from these treatments were well above 65%, but they were below it in 1954 and 1955, when summer temperatures were cooler. During the 1953–56 period, drying times for the 80° continuous treatment averaged 33 days and for 95°, 21 days. Although a continuous temperature of 80° was necessary to ensure satisfactory seed germination in all seasons, it is suggested that, where rapid drying is desired, a constant temperature of 95° F. be employed when summer weather favouring maturity has preceded seed harvest. [From author's abstract.]—Canada Dep. Agric., Saanichton, B.C.

2515. Crooke, W. M., Knight, A. H., and MacDonald, I. R.
Cation-exchange capacity and pectin gradients in leek root segments.
Plant and Soil, 1960, **13**: 123-7, bibl. 10.

Cation-exchange capacity, pectin, respiration and nitrogen content have been measured in successive segments of leek roots over a distance of 140 mm. from the root tip. All are highest at the root tip and decrease with increasing distance from the root tip. [Authors' summary.]—Macaulay Inst. Soil Res., Aberdeen.

2516. Doepel, R. F.
Downy mildew of onions.
J. Agric. W. Aust., 1960, **1**: 775-6, illus.

Symptoms caused by *Peronospora destructor* and notes on control with zineb, etc.

2517. Duran, R., and Fischer, G. W.
The efficacy and limitations of hexachlorobenzene for the control of onion smut.
Plant Dis. Reptr, 1959, **43**: 880-8, bibl. 4, illus.

The results of 2 years' fungicide trials in the field and greenhouse on the control of onion smut, *Urocystis colchici* (*U. cepulae*), indicate that this disease can be controlled with hexachlorobenzene. In naturally-infested soil untreated seed produced up to 92% smutted seedlings, whereas with seed pelletized with 80% HCB infection was as low as 0·41%. There were marked differences between proprietary formulations of HCB in efficacy and phytotoxicity.—Wash. agric. Exp. Stat., Pullman.

2518. Newhall, A. G., and Wilkinson, R. E.
Liquid nabam and N-dure as substitutes for formaldehyde in the control of onion smut, *Urocystis cepulae*.
Plant Dis. Reptr, 1960, **44**: 332.

Successful greenhouse trials with nabam, N-dure (59% formaldehyde plus 26% urea) and formaldehyde were followed by 2 field trials in which 1% solutions of these materials were applied at 125 gal. per acre. The percentage of smutted seedlings was reduced from 43 and 31 in the controls to 2·2 or less in the treated plots. The treatments raised yields by 23–32%.—Cornell Univ.

2519. Hickman, C. J., and Coley-Smith, J. R.
Onion white rot.
N.A.A.S. quart. Rev., 1960, **12**: 58-62, bibl. 13.

The authors review the present state of knowledge on the biology of *Sclerotium cepivorum*, and suggest that the ability of *Allium* extracts to stimulate the germination of the sclerotia may possibly provide a new method of control.—Univ. west. Ont., and Wye Coll., Univ. London.

2520. Guillemat, J., and Bigot, C.
Microflore fongique d'un sol du Puy-de-Dôme et de la rhizosphère de l'ail. Incidence du traitement des cayeux contre *Sclerotium cepivorum* Berk. sur cette microflore. (**Fungal microflora of a soil at Puy-de-Dôme and of the rhizosphere of garlic. Effects of the treatment of the cloves against *Sclerotium cepivorum* on the microflora.**) [English and German summaries ½ p. each.]
Ann. Épiphyt., 1960, **11**: 217-49, bibl. 10.

In clayey and chalky soils 127 different fungal species were present. Treatment of the garlic bulbs with thiram, copper oxyquinolate, N trichloromethylthiophthalimide and 1-oxide-2-pyridinethione did not protect the plants against *S. cepivorum* and had no pronounced effect on the rhizosphere microflora.

2521. Cayrol, J. C., and others.
Études preliminaires sur une maladie vermiculaire de l'ail provoquée par *Ditylenchus dipsaci* (Kuehn). (**Preliminary studies on a disorder of garlic caused by *Ditylenchus dipsaci* (Kuehn).**)
Phytiat.-Phytopharm., Paris, 1960, **9**: 181-90, bibl. 9.

Control trials were carried out with DD, dibromethane and Vapam. The best vegetative growth was obtained with 1,000 l. Vapam per ha., but DD at 300 l. per ha., and DBE at 350 l. per ha. were more effective in reducing *Ditylenchus* populations than Vapam at 300 l. per ha.—Stat. Zool. agric., Antibes.

2522. Lange, W. H., and Mann, L. K.
Fumigation controls microscopic mite attacking garlic.
Calif. Agric., 1960, **14**(12): 9-10, illus.

Three mite species, *Aceria tulipae*, *Rhizoglyphus callae* and *Glycophagus domesticus*, may be satisfactorily controlled by post-harvest fumigation with methyl bromide. Fumigation with 2 to 2·5 lb. methyl bromide per 1,000 cu. ft. at 80° F. for 2 hours gave excellent control with no injury to the garlic. Dusting with sulphur before storage prevents the mites from entering the bulbs.—Univ. Calif., Davis.

2523. Perron, J. P., Jasmin, J. J., and Lafrance, J.
Attractiveness of some onion varieties grown in muck soil to oviposition by the onion maggot (*Hylemya antiqua* (Meig.)) (Anthomyiidae: Diptera).
Canad. Ent., 1960, **92**: 765-7, bibl. 3.

In field and greenhouse tests varieties of *A. fistulosum* were much less attractive to onion flies than those of *A. cepa.* The hybrid Beltsville Bunching was intermediate. [For earlier work see *H.A.*, 29: 1481.]—Res. Lab., St. Jean, Quebec.

2524. Rawlins, W. A., and others.
The onion maggot and its control.
Bull. Cornell Univ. agric. Exp. Stat. **947**, 1960, pp. 18, bibl. 5, illus.

The life cycle of *Hylemyia antiqua* is outlined. Coating the seeds with aldrin gave good control. In-the-row soil treatment with drenches, dusts or granules of aldrin, dieldrin, heptachlor and parathion also proved effective.

2525. Johnston, C. J. R.
The onion seedling maggot.
J. Agric. Vict., 1960, **58**: 681, illus.

If land on which the previous crop was infested by *Hylemyia cilicrura* is to be replanted, the crop residues should be sprayed with dieldrin e.c. 15% (1⅓ gal. in 5–30 gal. water per acre) before ploughing them in. Heptachlor and endrin have also given commercial control.

2526. Wilcox, J., and Shirck, F. H.
The onion thrips: how to control it.
Leafl. U.S. Dep. Agric. **372**, revised 1960, pp. 4, illus.

Life history and control of *Thrips tabaci* on onions grown for bulbs, for seed and as green onions.

2527. Lall, B. S., and Singh, L. M.
On the biology of the onion thrips, *Thrips tabaci* (Lind.) (Thysanoptera: Thripidae).
Curr. Sci., 1960, **29**: 314-16, bibl. 12, illus.

Infestation was low on acid clay soils that were low in N and high in P and K. Fortnightly sprays with 0·02% Folidol gave the best control. BHC, aldrin, dieldrin and endrin gave fair control, but DDT and diazinon were ineffective.—Bihar agric. Coll., Sabour.

Rhubarb.

2528. Kennelly, A. G.
Vegetable growing for home and market gardeners. Rhubarb.
N.Z. J. Agric., 1960, **101**: 130-4, illus.

Propagation, planting, cultivation, manuring, forcing, harvesting, diseases and their control discussed.

2529. Potter, H. S., and Murakishi, H. H.
Foliar damage to hothouse grown rhubarb from sulfur dioxide fumes.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 147-8, illus.

The use of coke or soft coal for heating produced SO_2, which, with condensed moisture, formed acid. This acid accumulated at the base of rhubarb leaf blades causing browning and burning of the tissue.

Root crops.

(*See also* 1733, 1755, 2318, 2321, 2338, 2346, 2348, 2375, 2376, 2382-2384, 3566.)

2530. Orphanides, J.
Carrot observation trial 1959.
Countryman, Nicosia, 1960 Sept.-Oct., pp. 17, 19.

In 2 trials involving 31 varieties Chantenay proved the most suitable for the export trade and Nantes Improved for the local market.

2531. Aki, S., and Watanabe, S.
Studies on the storage of the seeds of Kintoki carrot. II. Influence of seed moisture on the germination of stored seeds.
Aki, S.
Idem. III. On the artificial drying of the seeds. [Japanese, with English summaries.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **10**: 27-8, bibl. 2, and **11**: 162-7, bibl. 17.

Seeds with a moisture content below 10% kept for 11 months without a decline in viability. Moisture contents above 12% were harmful; above 14% moisture the seeds showed reduced germination after 2 months' storage, and above 16% moisture the seeds failed to germinate after this period. Part III reports that the highest heat resistance was found in mature seeds (38 days after flower opening). Mature seeds with a 24·4% moisture content were successfully dried at 40° C. for 20 hours, at 50° C. for 8 hours and at 60° C. for 1 hour. Seeds with a moisture content of 17·8% were dried at 40° C. for 45 hours, at 50° C. for 8 hours and at 60° C. for 3 hours. [For part I, see *H.A.*, 27: 1511.]

2532. Watanabe, S., and Aki, S.
On the germination of Kintoki carrot seeds. V. Germination inhibitors in seeds. [Japanese, with English summary ⅔ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 155-61, bibl. 12.

The germination was recorded of seeds soaked in tap water and seeds soaked in a water extract of carrot seeds and also in ethyl alcohol and ethyl ether extracts of seeds. Different parts of the seed were tested to locate the germination inhibiting substance. The variation in germination rates of seeds harvested at different times or stored under various conditions was also studied. Germination inhibiting substances were present in all parts of the seed but especially in the pericarp. They inhibited the germination of vegetable seeds other than carrot, and showed various effects according to the time of harvest, maturity and individuality of the seeds from which they were extracted. Sunlight, heat or dryness did not affect their inhibiting ability.

2533. Lagerwerff, J. V., and Holland, J. P.
Growth and mineral content of carrots and beans as related to varying osmotic and ionic-composition effects in saline-sodic sand cultures.
Agron. J., 1960, **52**: 603-8, bibl. 20.

The effects are evaluated of factorial variation in the level of salinity and the sodium-adsorption-ratio of complete nutrient solutions used for periodic irrigation of two varieties of carrots and of red kidney beans grown in sand culture. For both salinity and the sodium-adsorption-ratio statistical analysis of the data indicates significant differences in yield and mineral composition. It appears that the tolerance of plants for Na depends on the level of salinity, and the tolerance for salinity on the level of Na of the growth medium. Significant correlations were shown between K and P contents of the plants under the saline-sodic treatments applied. [Authors' summary.]—U.S.D.A., Riverside, Calif.

2534. Matuura, H.
A study on the year-round culture of vegetables containing pigments other than chlorophyll. No. 2. The influence of temperature and fertilization on the growth, colouring and sugar content of Sanzun carrots. [Japanese, with English summary ⅓ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 41-7, bibl. 7.

Maximum root growth occurred 30–80 days after germination at a temperature of 20° C. with an application of N (7·5–11·25 kg./10a.) and K (3·75–7·5 kg./10a.). The maximum accumulation of carotene occurred at 18–20° C. when N was applied 80–90 days after sowing, and was high in a spring sowing and low in an autumn sowing. N fertilization at 20° C. also increased the sugar content.

2535. Watson, M. A.
Carrot motley dwarf virus.
Plant Path., 1960, **9**: 133-4, bibl. 5, illus.

The virus, recently identified in England, appears to cause substantial yield reductions.

2536. Smith, H. C., Giesen, H. J., and Allen, J. D.
Control of motley dwarf virus disease in carrots.
N.Z. comm. Gr, 1960, **16**(2): 13-14, bibl. 1, illus.

In trials with the varieties Early Horn, Chantenay Red Core, Manchester Table, Early Nantes, Sweetcrop and Topweight only the last two were resistant to the disease. Maximum control in the remaining early cropping varieties was obtained by spraying against the vector *Cavariella aegopodii* at fortnightly intervals from emergence to mid-November with an organo-phosphorus compound such as Metasystox (8 or 10 oz./acre) or with lindane-nicotine (2 lb. 25% + 1 pt. 40%/acre). DDT was also effective when applied at 7–10-day intervals.—D.S.I.R., Lincoln, N.Z.

2537. McLean, D. M.
Two years' observations of leaf spot and blight of carrots in the Rio Grande Valley.
J. Rio Grande Valley hort. Soc., 1960, **14**: 169-71, bibl. 4, illus.

Both *Cercospora carota* and *Alternaria dauci* responded to treatment with bordeaux 6 : 6 : 100 at 10-day intervals and with zineb at 2 lb. per 100 gal. —U.S.D.A. and Tex. agric. Exp. Stat., Weslaco.

2538. Buffington, G. A.
Gibberellin foliar spray on fresh market carrots.
J. Rio Grande Valley hort. Soc., 1960, **14**: 125-7.

The application of 10 and 20 p.p.m. of Gibrel in water to carrots that were severely damaged by *Cercospora* leaf spot and other blights gave highly significant increases in yield.—Tex. agric. Exp. Stat., Crystal City.

2539. Wheatley, G. A., Wright, D. W., and Hardman, J. A.
The re-treatment of soils with dieldrin for the control of carrot fly.
Plant Path., 1960, **9**: 146-8, bibl. 5.

In the United Kingdom the half-life of dieldrin in soil appears to be not less than 4 years. It therefore seems probable that residues will reach undesirable levels if the soil is re-treated too frequently at the rates recommended. Reduced amounts of dieldrin to be used in re-treating soils in order to maintain the original concentration are tabulated. [See also *H.A.*, 30: 3880.]—Nat. Veg. Res. Stat., Wellesbourne.

2540. Harris, E., Jr., and Rawlins, W. A.
Carrot rust fly and its control.
Bull. Cornell Univ. agric. Exp. Stat. **946**, 1959, p. 20, bibl. 11, illus.

Seed treatment (1 lb. aldrin to 10 lb. seed) or a row application of 2·4 lb. of insecticide per acre protected carrots from attack by 1st generation larvae of *Psila rosae*. The application of 2–4 lb. per acre of insecticide broadcast over the soil surface and rotary tilled into the upper 3–4 inches gave good control of both generations. The chlorinated hydrocarbons, aldrin, dieldrin and heptachlor, were the most effective insecticides tested.

2541. Marlatt, R. B., Tucker, H., and Stewart, J. K.
Evaluation of chemical dips for control of decay in packaged carrots.
Plant Dis. Reptr, 1959, **43**: 741-4, bibl. 8.

A 0·01% solution of sodium hypochlorite used as a dip for topped and washed carrots before they were packed in perforated polythene bags was effective in reducing decay during storage at 70° and 80° F. Carrots stored at 40° and 50° F. showed no response to hypochlorite treatment. In one of the 5 experiments sodium hypochlorite was sufficiently phytotoxic to increase bacterial and *Penicillium* rots. Sorbic acid dips reduced *Alternaria* rot in only 1 test and did not affect soft-rot bacteria, *Mucor* or *Penicillium* sp. There was considerably less decay in carrots held at 40° F. than at 50° F. or higher. [From authors' abstract.]—Ariz. agric. Exp. Station, Tucson.

2542. Boerema, G. H.
Chalaropsis thielavioides Peyr. op wortelen verpakt in geperforeerde polyethyleen zakjes. (***Chalaropsis thielavioides* on carrots pre-packed in perforated polythene bags.**) [English summary ¼ p.]
Meded. PlZiekt. Dienst **134**, 1960, pp. 158-61, bibl. 8, illus.

Chalaropsis was shown to invade carrot tissue through lesions in the epidermis caused when the roots were washed. Further development of the fungus was favoured by the conditions of humidity and temperature inside the polythene bags.

2543. Skou, J. P.
Microbiological studies in connection with irradiation of carrots.
Rep. Danish atom. Energy Commiss., Risö, **16**, 1960, pp. 79-83, bibl. 22, illus.

During 5 weeks' storage at 12° C. and 95–100% R.H. carrots irradiated with 100 kilorad of gamma rays did not sprout or show fungus attack. At higher irradiation doses, however, fungus attack became more severe.

2544. Watts, L. E.
The use of a new technique in breeding for solidity in radish.
J. hort. Sci., 1960, **35**: 221-6, bibl. 3.

The immersion of radish roots in water facilitated the selection of solid roots to be used as parent plants without producing adverse effects on their subsequent growth. Pithiness occurred in a large number of roots before they had reached marketable size, but progenies of pairs of plants selected by the immersion method showed considerably less pithiness than the parental types.—Nat. Veg. Res. Stat., Wellesbourne.

2545. Szember, A.
Influence on plant growth of the breakdown of organic phosphorus compounds by micro-organisms.
Plant and Soil, 1960, **13**: 147-58, bibl. 26, illus.

Soil organisms, which were found to be active in the breakdown of phytin and lecithin, were isolated and used to inoculate radish plants grown under sterile conditions on sand or agar substrates with phytin and lecithin as P sources. These plants were compared with plants grown in non-sterile sand cultures and plants given KH_2PO_4. Fresh weight and N and P contents showed that radishes are able to utilize phytin and, to a lesser extent, lecithin without the aid of micro-organisms. In the phytin-containing medium inoculation with soil organisms had a slight effect in some cases.—Agric. Coll., Lublin, Poland.

2546. Crüger, G., and Leuchs, F.
Beitrag zum Auftreten und zur Bekämpfung des Gefleckten Kohltriebrüsslers (*Ceuthorrhynchus quadridens* Panz.) an Rettich (*Raphanus sativus* L.). **The occurrence and control of the cabbage stem weevil, *Ceuthorrhynchus quadridens*, on radish.**) [English summary 4 lines.]
NachrBl. dtsch.PflSchDienst., Braunschweig, 1961, **13**: 12-13, bibl. 5, illus.

The damage caused by *C. quadridens* and that caused by cabbage root fly (*Erioischia brassicae*) are compared. The root fly tunnels along the surface of the underground part of the root, whereas the weevil tunnels in the petioles and through them enters the top of the root. The control measures adopted against the cabbage root fly are without effect on the weevil, since its entire larval life is spent in the interior of the radish. Satisfactory control, however, is said to have been obtained with several spray materials but no recommendations are made.—Inst. Gemüsekrankh., Fischenich, Köln.

Spinach.

(*See also* 1733, 1787, 1800, 2331, 2343, 3614.)

2547. Watanabe, S., and Aki, S.
Effect of heat treatment on the germination of spinach, *Spinacea oleracea* L. [Japanese, with English summary ½ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **10**: 20-6, bibl. 14.

Seed treatment at 50–60° C. for 7 days or at 70–75° C. for 1 hour often stimulated subsequent germination. The influence of the heat treatment was generally most marked in varieties with large seeds. Heat-treated seeds seemed to absorb moisture more readily.

2548. Menges, R. M.
Pre-emergence chemical weed control in spinach.
From abstr. in *Proc. 13th annu. Mtg south. Weed Conf., 1960*, pp. 67-8.

When it was applied to a hot, dry seed-bed the same day as spinach was sown and the area was irrigated 10 days later, 6 lb./acre of CDT (2-chloro-4,6-bis(diethylamino)-s-triazine) controlled weeds without crop injury. In another trial CDEC at 6 or 8 lb./acre and also CDEC at 4 lb. + diuron at 0·33 lb./acre gave promising results.—U.S. Dep. Agric., Weslaco, Tex.—From *Weed Abstr.*, 9, No. 1407.

2549. HARDING, J. A.
Control studies of curly-top virus disease on spinach in the Winter Garden area of Texas.
J. Rio Grande Valley hort. Soc., 1960, **14**: 120-4, bibl. 5.

The results of experiments on the chemical control of the leafhopper vector, *Circulifer tenellus*, are given. With malathion the most effective time for spraying was at the cotyledon stage. Three applications of Perthane at 7-day intervals also gave a marked reduction in affected plants. Among systemic insecticidal treatments granular Thimet at $\frac{3}{4}$ lb. per acre was the most efficient.—Tex. agric. Exp. Stat., Crystal City.

Sweet and red peppers and eggplants.

(*See also* 2321, 2339, 2606, 2682, 2724, 3563.)

2550. MARANI, C.
Il peperone. (**Red peppers.**)
Progr. agric., Bologna, 1960, **6**: 1306-9, illus.

Growing and marketing under the co-operative system in Carmagnola, Italy.

2551. NORO, K.
Promising variety of pimiento. [Japanese, with English summary $\frac{1}{2}$ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **10**: 14-19, bibl. 10, illus.

Japanese capsicums resemble the American but differ from those of Spain and Italy. Japanese capsicums have medium-sized fruits with very thick walls and smooth external contours. In shape they are oblate, round, pointed or elongated according to variety. The flesh is non-pungent. Morron and Perfection are the most important varieties, and these and several others are described and illustrated.

2552. SMITH, P. G., AND LIPPERT, L. F.
Plant breeding of commercial peppers for disease resistance.
Calif. Agric., 1960, **14**(11): 13.

Strains resistant to tobacco mosaic virus have been produced, but genetic resistance to cucumber mosaic viruses and to verticillium wilt has so far not been found. Resistance to the root-knot nematode is also being sought.—Univ. Calif., Davis.

2553. SOWELL, G., JR.
Bacterial spot resistance of introduced peppers.
From abstr. in *Phytopathology*, 1960, **50**: 577.

Screening of 30 commercial varieties and strains and 600 introductions has shown the varieties Santanka and Red Chili to be more resistant than California Wonder or Improved Truhart Pimiento. The highest resistance was shown by several introductions from India and by the variety Anaheim.

2554. TAYLOR, J.
Studies on the relation of fertilization to development of bacterial and *Cercospora* leaf spots in pepper.
From abstr. in *Phytopathology*, 1960, **50**: 577.

In studies on the development of *Xanthomonas vesicatoria* and *Cercospora capsici* on pepper the following fertilization rates were compared in 2 tests: an unfertilized check and $N–P_2O_5–K_2O$ rates of 75–75–75, 150–150–150, 300–300–300, 600–600–600 and 1,200–1,200–1,200 lb. per acre. In one test all the plots were sprayed 3 times with $\frac{3}{4}$ lb. Manzate (70%) plus 2 lb. tribasic copper sulphate (53%) per 100 gal.; in the other test no sprays were applied. Bacterial spot development was similar in both tests during the first 6 weeks after transplanting. The average number of leaves lost per plant in the sprayed test was 19·6 for unfertilized plots and 12·2, 9·6, 6·6, 1·3 and 1·4, respectively, for plots with increasing rates of fertilization. There was no correlation between bacterial spot development and percentages of N, P and K in the pepper leaves. Cercospora leaf spot developed uniformly in the unsprayed test and almost completely defoliated the plants by September.

2555. KIMBLE, K. A., AND GROGAN, R. G.
Resistance to *Phytophthora* root rot in pepper.
From abstr. in *Phytopathology*, 1960, **50**: 642.

A total of 613 lines, varieties or introductions of *Capsicum annuum* were screened, and seed was grown in soil inoculated with *Phytophthora capsici*. The variety Jalapeno was the most tolerant named variety, but not nearly so tolerant as several P.I. selections.

2556. SRINIVASAN, P. M., AND GOWDER, R. B.
A note on the control of the brinjal shoot and fruit borer—*Leucinodes orbonalis* G.
Indian J. agric. Sci., 1959 (issued 1960), **29**: 71-3, bibl. 5.

DDT w.p. as a 0·1% spray proved the most economical of several methods of control, giving the highest return and yield.—Agric. Res. Inst., Coimbatore.

Tomatoes—general.

(*See also* 1792, 1897, 3561, 3562, 3573, 3591, 3595.)

2557. PAGNIELLO, L.
La coltivazione in serra del pomodoro. (**Growing tomatoes under glass.**)
Inf. Ortofrutt., 1960, **1**: 53-4, 60-2, illus.

A general article, covering glasshouse types, sizes and positioning, heating, suitable tomato varieties, soils, cultural practices and production.

2558. Favilli, R.
Aspetti tecnici ed economici delle colture idroponiche. (**Technical and economic aspects of soilless culture.**)
Riv. Ortoflorofruttic. ital., 1959, **43**: 199-217, illus. [Omitted in error from *H.A.*, 30(1).]

The article is mainly concerned with installations for growing tomatoes under glass in sub-irrigated, inert media. Special reference is made to the Italian hydroponic glasshouses at Albenga [see also *H.A.*, 30: 1537], where yields of early tomatoes have ranged from 20 to 25 kg./sq. m., occasionally reaching 30 kg.

Tomatoes—breeding and varieties.

(*See also* 2611, 2617.)

2559. Cooke, D., and Sheard, G. F.
Survey of tomato varieties grown under glass in Great Britain, 1959.
A.R. Glasshouse Crops Res. Inst., 1959, 1960, pp. 126-38.

Although 70 varieties were being grown commercially, the varieties Moneymaker, Potentate, Ware Cross and Ailsa Craig accounted for 69% of the total acreage.

2560. Turchi, A.
Contributo alla selezione del pomodoro da esportazione. (**A contribution to the selection of tomatoes for export.**)
Inf. Ortofruttic., 1960, **1**: 29-31, illus.

Of the 65 tomato varieties studied 23 are listed as suitable for export from Italy. Fruit characteristics are described for Nunhem's Tuckqueen, Moneymaker, Gloria della Renania and Tip Top.

2561. Forbes, I. G.
Outdoor tomato varieties.
N.Z. J. Agric., 1960, **101**: 361-3.

Suitable varieties for home, market growing and processing in New Zealand.

2562. Mortesen, E.
Tomato variety trials in El Salvador.
Proc. Carib. Reg. Amer. Soc. hort. Sci. 1959, 1959, **7**: 58-68, bibl. 3.

The behaviour of 78 varieties and selections was studied under tropical conditions. Thirteen varieties gave good yields in the dry season, and six were promising in the rainy season. Varieties resistant to cracking and those apparently resistant to early blight are also listed.—San Andrés exp. Stat., El Salvador.

2563. Board, P. W.
Evaluating tomato varieties for processing.
Tech. Pap. C.S.I.R.O. Aust. Div. Food Pres. Transport **17**, 1960, pp. 11, bibl. 10, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-230.

Field design and sampling procedures are described for use in variety evaluation trials of tomatoes for processing (from the viewpoint of the comminuted product) in terms of yield, chemical composition and organoleptic qualities. The results obtained by application of these procedures to 4 crops, including 9 varieties, are reported. The variety Urbana was superior to all others in yield and solids content.

2564. Johnson, K. W., and others.
Performance of processing tomato varieties in Indiana, 1956-1959.
Res. Bull. Purdue Univ. agric. Exp. Stat. **696**, 1960, pp. 11.

Varieties tested included Urbana, Improved Garden State, Purdue 1361, Rutgers, Kokomo, Rutgers × Pritchard F_2 and several new varieties. Evaluations included fruit size, colour, total solids, pH, and total and early yields. Satisfactory yields were obtained from the standard varieties, but higher yields were obtained from two new varieties, Roma, a wilt-resistant paste type, and Tecumseh, a wilt-resistant Urbana type. Owing to variety-season interactions 2 or more varieties should be grown at any one site.

2565. Dacus, A.
Tomato varieties for production in a plastic greenhouse.
J. Rio Grande Valley hort. Soc., 1960, **14**: 172-7, bibl. 4.

Step 314 and Tuckross "O" were the best of several varieties under Texas conditions.

2566. (Currence, T. M.)
Tomatoes. Early hybrid developed.
Amer. Veg. Gr, 1960, **8**(9): 15.

The hybrid Bounty × Earliana gives a heavy crop of small, good quality fruit early in the season.

Tomatoes—stringing.

2567. Turner, R.
Stringing tomatoes.
Comm. Gr, 1960, No. 3384, p. 1041.

Several suggestions are made for reducing the time spent in stringing glasshouse tomato plants. These include: reducing the height of the central wires under the ridge, so that they can be strung from the ground; carrying a bunch of cut string while stringing, to eliminate the prior operation of putting out a string at each plant; and adopting a regular routine to reduce walking.—W. Scot. agric. Coll.

Tomatoes—soil management, irrigation and nutrition.

(*See also* 1713, 1718, 1722, 1728, 1730, 1829, 2580, 2583-2587, 2593, 2610, 2615, 2620, 2624, 2628, 2630, 2632, 2633, 2643, 2916, 3596.)

2568. Flocker, W. J., and Menary, R. C.
Some physiological responses in two tomato varieties associated with levels of soil bulk density.
Hilgardia, 1960, **30**: 101-21, bibl. 27.

When the soil air spaces amounted to about 7% the soil density was 1·4. With less air space the emergence of tomato seedlings was slowed down. Plant height, 9 weeks after planting, was 50% less at a soil density of 1·1 than at 1·7 and bud counts were 4 times greater. Maximum root density was restricted to the top inch of soil in pots compacted to a density of 1·7 and to the 4–6 in. layer in those compacted to a density of 1·4. High protein and low sugar contents were characteristic of tomatoes grown on compacted soil. Maximum Ca absorption occurred at a soil density of 1·4. Ca fertilizer applied at 30 and 60 p.p.m. at densities of 1·1 and 1·4 caused decreased P absorption and increased Mg absorption. Reduced Mg absorption at a soil density of 1·7 was due to inadequate distribution of roots. Varietal differences were found between Sutton's Best of All and Pearson.—Univ. Calif., Davis.

2569. White, R. A. J.
Maize as a glasshouse greencrop and its worth as a soil-conditioner for Auckland tomato glasshouses.
N.Z. comm. Gr, 1960, **16**(4): 28.

A discussion of its advantages and disadvantages as a 6–7-week green manure crop.

2570. Read, W. H.
Investigations on soil sterilization: preliminary results of a comparison between metham-sodium, steam and chloropicrin.
A.R. Glasshouse Crops Res. Inst. 1959, 1960, pp. 105-7, bibl. 1.

Compared with unsterilized soil, metham-sodium soil treatment resulted in stimulation of growth and cropping of tomatoes equal to that produced by chloropicrin and steam sterilization.

2571. Forbes, I. G.
Developments in growing glasshouse tomatoes.
N.Z. J. Agric., 1960, **101**: 459-69, illus.

Soil sterilization with chloropicrin has proved successful if carried out while soil temperatures are above 55° F. A 1 : 49 formalin solution should be used instead of water as a seal following chloropicrin treatment. Methods of disease control, watering and nutrition are discussed. Trials at Levin over 3 years have failed to show any difference between plants fed with conventional dry fertilizer and those supplied with trickle irrigation and liquid feeds; normal, half-normal and twice-normal rates of application of liquid feed produced no differences in yield of marketable fruit. Trickle irrigation and liquid feeding tended to increase soil acidity more than dry fertilizers and watering.

2572. McGuire, D. C.
Tomato root growth and plant placement.
Hawaii Fm Sci., 1960, **9**(1): 6-7, bibl. 1, illus.

Examination of the root systems of tomato plants grown with and without black plastic mulch and set 12 in. from the centre of irrigation furrows, spaced 60 in. apart, showed that all the major roots curved away from the irrigation furrows. This was expected in the mulched plants, since the fertilizer had been placed along the centres of the beds, but in the unmulched plants it was thought to be due to the movement of nutrients, particularly N, with the irrigation water from the furrow toward the centre of the bed and also to the compaction of soil in the furrow, which reduced the volume of soil available to the plant. In all cases higher yields were produced by the mulched plants.

2573. Mohr, W. P., and Heeney, H. B.
Tomato irrigation study.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 25.

Fruit diameter was increased by irrigation and by normal spacing, compared with close spacing, in Ferguson tomatoes. The pH of the fruit under irrigation was 0·1 higher than that of non-irrigated fruit.—Cent. exp. Farm, Ottawa.

2574. Webster, A. B., and Boyce, W. R.
Home-made liquid feeds for trickle-irrigated glasshouse tomatoes.
N.Z. comm. Gr, 1960, **16**(3): 26, 28, 30.

In trials over 2 seasons at the Levin Horticultural Research Station the following solutions have given good results with a September-planted, cold-glasshouse crop: 8 oz. potassium nitrate plus 13½ oz. ammonium sulphate in 1 gal. and diluted to 1 in 80, or 1½ lb. of potassium nitrate plus 1½ lb. of ammonium nitrate in 1 gal. used at 1 in 250. The amount of diluted feed given per plant will vary from ½ to 3 or 4 pints per day, depending upon the strength of the solution.

2575. Hagin, J., and Shmueli, E.
Determination of available nutrients and fertilizer requirements of winter tomatoes in the Jordan Valley.
Ktavim, 1960, **10**: 43-52, bibl. 13.

Response to N, P and K fertilization was small or nil owing to a high level of available nutrients in the soil. The soil nitrate test would probably give a fair indication of N requirements. Leaf nitrate levels lower than 1,000 p.p.m. at the beginning of picking or early in the spring may also indicate a shortage of available N in the soil and thus provide guidance on the application of top dressings.

2576. Foti, S.
Un biennio di esperienze con concimi complessi su pomodoro e patata. (**Two years' experiments with compound fertilizers on tomato and potato.**)
Tecn. agric., 1959, **11**: 605-19, bibl. 19.

Sixteen N, NP and NPK formulations, supplying 60–100 kg. N, 50–170 kg. P_2O_5 and 75–125 kg. K_2O per ha., were compared on Nunhem's Tuckqueen tomatoes grown on a soil containing 0·64‰ N, 320 kg. assimilable P_2O_5 and 400 kg. exchangeable K_2O per ha. The best results were given by NPK formulations supplying 61·5 kg. N (partly top-dressed), 64·35 kg. P_2O_5 and 76·05 kg. K_2O per ha.—Ist. Agron. gen., Univ. Catania.

2577. Dotti, F., and Cobianchi, D.
Importanza delle concimazioni fosfatiche per la produttività del pomodoro. (**Importance of phosphatic manuring for productivity of tomatoes.**)
Progr. agric., Bologna, 1960, **6**: 930-49, illus.

In one-year trials with Ace and S. Marzano tomatoes in Emilia superphosphate at 10–12 quintals per ha. increased vigour and yield and promoted early maturation.—Ist. Colt. arb., Univ. Milano.

Tomatoes—environment, growth and physiology.

(*See also* 1702, 1713, 1733, 1751, 1759, 1762, 1771, 1845, 1896, 1897, 2324, 2325, 2568.)

2578. Gladstones, J. S., and Hunter, A. W. S.
Effects of seed moisture content and post-irradiation storage on the growth and survival of X_1 tomato plants.
Reprinted from *Canad. J. Genet. Cytol.*, 1959, **1**: 339-46, bibl. 6.

Seeds of the cherry tomato (*L. esculentum* var. *cerasiforme*) were given X-ray doses of 5, 10, 25 and 50 kr at each of 12 moisture contents ranging from 1·2 to 33·3% (wet weight basis). After irradiation the seeds were maintained at their respective moisture contents until planting at 4-week intervals, with the first planting the day after irradiation. No difference in X-ray sensitivity could be detected between seeds irradiated at 12·2 and 19·6% moisture (stored at 84 and 94% R.H., respectively). Sensitivity steadily increased below 12·2% until at the lowest moisture content, 1·2%, the seeds were at least 10 times more sensitive than at 12·2%. Within this range the relationship between the dose tolerated and storage relative humidity was linear. At the highest moisture content, 33·2%, there was again a marked increase in sensitivity. Compared with the controls, there was no detectable change in either growth or survival as a result of post-irradiation storage at any moisture content. [From authors' summary.]—Genet. and Plant Breed. Inst., Ottawa.

2579. Rogers, I. S.
Frost and polythene-lined tomato glasshouses.
J. Agric. S. Aust., 1960, **63**: 489.

Temperature records are given for lined and unlined houses at Morphettville, S. Australia. Lining sides and ends only provided insufficient protection against frost. Lining the whole house, although more satisfactory as regards frost protection, may well be too expensive.

2580. Wittwer, S. H.
Practices for increasing the yields of greenhouse tomatoes.
Circ. Bull. Mich. agric. Exp. Stat. **228**, 1960, pp. 30, bibl. 7, illus.

Air and soil night temperatures of 52–54° F. are recommended for 10 days to 3 weeks following cotyledon expansion, according to the amount of sunlight available. Night temperatures should then be raised to 57–58° F. with day temperatures of 58–60° F. or of 65–70° F. if the weather is sunny. The plants may be sprayed with N-m-tolylphthalamic acid (1–2 g. 20% w.p./gal.) during flower formation instead of being given the cold treatment. High N and P levels during the early seedling stages, plenty of sun or artificial light, regular vibration for pollination, pruning and training, watering, fertilization and mulching are all necessary for high yields of good quality fruit.

2581. Davis, R. M., and Lingle, J. C.
The basis of shoot response to root temperature in tomato.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): iii.

Under normal mineral nutrition and a temperature range of 15–25° C., shoot growth displayed greater sensitivity to root temperature than did root growth. The shoot mineral content could not be explained consistently on the basis of either active or passive uptake.—Ohio agric. Exp. Stat., Wooster, and Univ. Calif., Davis.

2582. Mobley, H. M., and Spear, I.
Some factors affecting the rhythmic nature of root pressure in tomato.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): viii.

Plants of the variety Marglobe were given various photoperiodic treatments under otherwise constant conditions. Preliminary results indicated that the so-called endogenous rhythms are markedly affected by environmental conditions.—Univ. Texas, Austin.

2583. Minshall, W. H.
The effect of nitrogen salts on the volume relationships between exudation and transpiration in *Lycopersicon esculentum* Mill.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): iv.

When high concentrations of nutrient salts were supplied under high moisture and optimum soil temperature conditions, the volume of liquid exuded from detopped plants usually exceeded 20% of the water lost by transpiration in intact plants, and the concentration of nutrient ions in the exudate was the same as, or even higher than, when exudation was low. Salts containing N, especially the ammonium ion, stimulated exudation.—Canada Dep. Agric., London, Ontario.

2584. Margolis, D.
The range of free amino acids and amides in tomato plants and the effects of nitrate or ammonium as nutrients.
Contr. Boyce Thompson Inst., 1960, **20**: 425-36, bibl. 11.

The experiments described relate to the effects of inorganic nitrogen nutrition upon the amino acids and amides soluble in 80% ethanol in the leaves and roots of tomato plants. NH_4-nutrition is correlated with a high amide level and NO_3-nutrition with high levels of dicarboxylic acids. Tomato plants which received a complete nutrient medium, but which were grown at different times, responded to uncontrolled fluctuations in the environment with an altered nitrogenous composition. [From author's summary.]

2585. Hill-Cottingham, D. G., and Lloyd-Jones, C. P.
Absorption and breakdown of iron-ethylenediamine tetraacetic acid by tomato plants.
Nature, 1961, **189**: 312, bibl. 6.

Tomato plants were fed with Fe-EDTA containing labelled Fe and labelled C. Later recovery showed a loss of C^{14} whereas the Fe^{59} was fully accounted for. The loss of carbon was therefore not due to decomposition of the Fe-EDTA in the nutrient solution but to break-down in the plant.—Long Ashton Res. Stat., Bristol.

2586. Gibson, W. B.
Flower setting and fruit yield of tomatoes in glasshouses.
Res. exp. Rec. Minist. Agric. Belfast, 1959, **9**: 97-105, bibl. 12.

The effects were compared, on flower setting and yield, of beta-naphthoxy acetic acid, 10% sucrose sprays and a truss vibrator. Beta-naphthoxy acetic acid and truss vibration increased flower setting. Truss vibration increased early yield and improved the grade of fruit in early yield. Beta-naphthoxy acetic acid and sucrose sprays did not increase early yield significantly. The number of flowers per plant was reduced by the use of a truss vibrator. Varietal response to truss vibration was demonstrated. The use of a truss vibrator 3 times a week produced a comparable yield to vibrating 6 times a week. [Author's summary].

2587. Berrie, A. M. M.
The effect of sucrose sprays on the growth of tomato.
Physiol. Plant., 1960, **13**: 9-19, bibl. 6.

Tomato plants growing under controlled conditions showed increases in their rates of growth and development following sprays of 10% sucrose solution. Plants placed in various day lengths (excluding those given 12 hours of light per day) showed larger absolute increases in dry weight as the amount of light received increased, although the relative increase in dry weight became less. There were no differences in sucrose utilization by plants growing in 3 light spectra with an 8-hour day, but with 16-hour days plants growing in yellow light made better use of applied sugar than those in green light.—Calif. Inst. Tech.

2588. Novák, J.
Zvýšení úrody rajských jablíček stimulací. (**Increasing the yield of tomatoes with growth substances.**) [Russian summary 11 lines.]
Rostlinná Výroba, 1960, **6**: 551-4, bibl. 10.

β-Indoleacetic acid was applied to the roots of the variety Ostrovsky. Using 5 mg. of heteroauxin per litre, one application of either 1 dcl. or 3 dcl. per plant resulted in a small increase in yield, but further applications were without significant effect. With 10 mg. hormone per litre 3 applications of 1 dcl. gave greatly increased yields, whereas single applications of larger quantities resulted in only small increases and repeated applications actually decreased yields.

2589. Negruckij, S. F.
The effect of gibberellin on the growth, productivity and fruit shape in tomatoes. [Russian.]
Fiziol. Rast., 1960, **7**: 734-5, illus.

GA at 0·02% enhanced growth and yields in tomatoes but also caused severe fruit malformation especially on the lowest truss. Lower rates of GA did not affect the fruit shape but gave smaller yield increases.

2590. Kiermayer, O.
Die formative Wirksamkeit der 2,3,5-Trijodbenzoesäure (TIBA) in Gegenwart von Gibberellinsäure (GA). (**The effect on tomato growth of TIBA in the presence of GA.**)
Planta, 1960, **55**: 153-68, bibl. 16, illus.

Tomato plants were treated in the cotyledon stage with TIBA, GA and mixtures thereof. GA alone resulted in increased internode growth, delay in blossom formation and simplification of leaf form.

It did not affect root formation. TIBA resulted in hypocotyl lengthening coupled with slight restriction of the internodes, restriction of growth in girth of the internodes, induction of ring fasciation, reduction of leaf area, malformation of side leaflets and pronounced restriction of root growth. Mixtures of GA and TIBA resulted in even greater lengthening of the internodes than GA alone, which indicates a synergistic effect of the two substances. The ring fasciation of the growing point and the reduction of leaf area caused by TIBA both became less pronounced when GA was also used. GA had no effect on the restriction of the internodal growth and root growth, both resulting from TIBA.—Österreich. Stickstoffwerke Aktiengesellschaft, Linz/Donau.

2591. Wittwer, S. H., and Tolbert, N. E.
(2-Chloroethyl) trimethylammonium chloride and related compounds as plant growth substances. III. Effect on growth and flowering of the tomato.
Amer. J. Bot., 1960, **47**: 560-5, bibl. 15, illus.

Application of 10^{-3}–10^{-7} M solutions of (2-chloroethyl) trimethylammonium chloride, (2-bromoethyl) trimethylammonium bromide, or (2,3-n-propylene) trimethylammonium bromide to the roots of tomato plants resulted in thicker stems, dark green savoyed leaves and earlier flowering. A stepwise regulation of the rate of growth and dry matter accumulation followed application of the chemicals at increasing concentration to cultural solutions. This growth response varied from stimulation at 10^{-7} M to a marked suppression at 10^{-4} M without delay of flowering or visible injury. Practical possibilities for the use of these compounds in tomato growing are discussed. (From authors' summary.]—Mich. St. Univ., East Lansing.

Tomatoes—disorders and diseases.

(*See also* 1794, 1821, 1844, 2225, 2339, 2562, 2570, 2571, 2643, 2645, 2724, 3584.)

2592. Johnson, J. C., and Aberdeen, J. E. C.
Tomato diseases and how to control them.
Qd agric. J., 1960, **86**: 535-49, 625-33.

Covering physiological as well as pathological diseases.

2593. Sinclair, J. B., and Brown, R. T.
The effect of calcium and molybdenum on yields and blossom end rot of tomato.
From abstr. in *Phytopathology*, 1960, **50**: 655.

Trials were carried out over 3 years using the variety Moreton hybrid. Plants were sprayed 4 times per season at weekly intervals, starting when the first fruit cluster appeared, with 88·8 g. calcium chloride per 4 gal. or with 1 g. sodium molybdate per 4 gal. Both treatments reduced the marketable yield, Ca to 21·9 and Mo to 22·0 from a control mean of 31·1 tons per acre, and the treated plants produced more cull fruit. However, both treatments significantly reduced the number of fruits with blossom-end rot.

2594. Young, P. A.
Crease stem with bunchy top of tomatoes.
From abstr. in *Phytopathology*, 1960, **50**: 577-8.

In 1959 summer tomatoes of many kinds showed combined symptoms of crease stem and bunchy top. In the variety Rutgers the creases were exceptionally deep and the pith was often browned under the creases. With few exceptions plants with creases also showed bunchy-top symptoms. Flowering was delayed 1–2 weeks in Rutgers but not in STEP 329. The following percentages of plants showed crease stem: Firesteel 2%, Greater Baltimore 43%, Hotset 4%, Rutgers 17%, Stokesdale 0%, STEP 329 40%.

2595. Murakishi, H. H.
Diagnostic aids in distinguishing internal browning and graywall of tomato.
From abstr. in *Phytopathology*, 1960, **50**: 648.

A comparative study of internal browning (IB) incited by strains of TMV and of graywall (GW) induced by low light intensity revealed certain distinguishing fruit characteristics. In parallel tests mature-green to ripe IB fruits developed dark, sunken areas in the shoulders, in contrast to smooth shoulders of GW fruits. GW fruits, however, frequently had prominent necrotic streaks of the vascular region in the lower half of the fruit extending to the stylar scar. Such symptoms were visible through the epidermis of GW fruits but were not seen in IB fruits. Indexing of fruits and young leaves for TMV served further to distinguish the 2 disorders. [For related work, see *H.A.*, 30: 5619 and 31: 823 and 824.]

2596. Nitzany, F. E., and Wilkinson, R. E.
The identification of some viruses affecting tomatoes in Israel.
Ktavim, 1960, **10**: 91-6, bibl. 19, illus.

Identification, host range, symptoms and physical characteristics of TMV and potato virus Y.

2597. Nitzany, F. E.
Tests for tobacco mosaic virus inactivation on tomato trellis wires.
Ktavim, 1960, **10**: 59-61, bibl. 5.

In inactivation tests satisfactory results were obtained by dipping the wires in one of the following solutions: caustic soda 0·1% for 10 minutes; trisodium phosphate 5% for 10 minutes; formalin 1% for 1–5 minutes. Heat treatment at 130° C. for 15 minutes was also effective.—Agric. Res. Stat., Beit Dagan-Rehovot.

2598. NITZANY, F. A.
Transmission of tobacco mosaic virus through tomato seed and virus inactivation by methods of seed extraction and seed treatments.
Ktavim, 1960, **10**: 63-7, bibl. 13.

Seeds extracted from the pulp by mechanical and fermentation processes and stored for over 10 months were still severely affected by TMV, although among some 1,600 seedlings raised from infected seed none was found to be infected. Satisfactory freedom from TMV on seeds separated from infected fruit was obtained with the acidification process of seed extraction, provided that this was carried out at 30° C. or more. The inactivation of TMV by dipping seeds for 15 min. in 10% trisodium phosphate was confirmed.—Agric. Res. Stat., Beit Dagan—Rehovot.

2599. ALEXANDER, L. J.
Inactivation of TMV from tomato seed.
From abstr. in *Phytopathology*, 1960, **50**: 627.

Soaking tomato seeds for up to 30 min. in 10% sodium phosphate reduced the amount of virus present and did not reduce germination. Several commercial detergents reduced the virus content, but only those containing Na_3PO_4 were as effective as Na_3PO_4 alone. Soaking the seed in trypsin and alcohol also reduced the amount of virus. Seeds from infected plants extracted with Na_3PO_4 yielded 2 infected seedlings out of 1,910 seeds compared with 70 infected plants from untreated seeds. No virus was found on seeds from infected fruit which had been extracted with concentrated HC1 (10 ml. per 25 lb. pulp), whereas 27 infected plants were found among 900 seedlings from untreated seeds.

2600. FRY, P. R., AND COLEMAN, B. P.
Tobacco mosaic virus in glasshouse tomatoes: effect of skimmed-milk sprays on incidence.
N.Z. comm. Gr, 1960, **16**(1): 25.

Rows of 13 plants, the first plant in each of which was inoculated with the virus, were sprayed with (1) fresh skimmed milk at 10%, (2) skimmed milk powder at 2 oz./gal. or (3) skimmed milk powder at 4 oz./gal., and were compared with an unsprayed control row. Data on spread of infection and yields showed that none of the sprays was effective. —D.S.I.R. and Dep. Agric. N.Z.

2601. CROWLEY, N. C., AND HANSON, J. B.
The infection of apical meristems of tomato roots with tobacco mosaic virus after treatment with ethylenediaminetetraacetic acid.
Virology, 1960, **12**: 603-6, bibl. 13.

When seedlings of the varieties Dwarf Champion and Crosse Lisse were grown in a nutrient solution containing EDTA, TMV infected the root meristematic cells and multiplied in these cells to a much greater extent than in more mature cells, thus reversing the usual procedure whereby many viruses do not infect meristematic cells.—Waite Res. Inst., Adelaide.

2602. SUTTON, W. S.
A vascular necrosis of tomato roots.
J. Aust. Inst. agric. Sci., 1960, **26**: 278-80, bibl. 1, illus.

Tomato root necrosis virus (TRNV) or drop head wilt considered to be a strain of TMV.

2603. BRAITHWAITE, B. M., AND BLAKE, C. D.
Progress in tomato yellow top disease control.
Banana Bull., 1960, **23**(8): 7.

In trials during the past season, in which a 0·025% spray of Meta-Iso-Systox was applied every 7 to 10 days from seedling emergence until the first truss of fruit matured, the incidence of virus-infected plants was reduced to 1% or less.

2604. KORENJAKO, A. I., AND KOVEŠNIKOV, A. D.
A search for antibiotic compounds from actinomycetes active against tomato tumours caused by *Pseudomonas tumefaciens*.
[Russian, with English summary 5 lines.]
Izv. Akad. Nauk SSSR, Ser. biol., 1960, No. 5, pp. 746-52, bibl. 5, illus.

In laboratory experiments the application of culture solutions of *Actinomyces rimosus*, *A. aurantiacus* and *A.* sp. P42 destroyed galls of up to 30 days old caused by *Pseudomonas* [*Agrobacterium*] *tumefaciens* on tomatoes.

2605. STALL, R. E.
An evaluation of spray materials for control of bacterial spot on field seeded tomatoes.
Plant Dis. Reptr, 1959, **43**: 725-8, bibl. 4.

Seedlings were sprayed 5 days after emergence, and applications were continued at intervals of 4 or 5 days until fruit set; at least 3 nozzles were used per row. Tribasic copper sulphate and streptomycin, alone and combined, gave good control of a relatively mild attack of *Xanthomonas vesicatoria*. CM-19, Nabac and Dyrene did not control the disease.—Indian River Field Lab., Fort Pierce, Fla.

2606. MCKEEN, C. D.
Maneb injury to tomato and pepper seedlings grown under glass.
Plant Dis. Reptr, 1959, **43**: 729-31, bibl. 3, illus.

It has been observed that maneb fungicides, used under glass, are frequently phytotoxic to capsicum and tomato seedlings. Characteristic injury appears on the hypocotyl as a collar of collapsed epidermal and cortical tissue just above the soil.—Canada Dep. Agric., Harrow, Ont.

2607. RODRIGUEZ LANDAETA, A.
Podredumbre del tallo en los almácigos de tomates. **(Tomato blight in the seed-bed.)**
Agric. venezol., 1960, **23**: 42-3, illus.

The symptoms of blight (*Alternaria solani*) are described. Recommended control measures are prompt destruction of diseased seedlings by burning, seed-bed soil disinfection with 6 l. 40% Formol in 100 l. water at 12–15 l. water per sq. m., and rotation of crops in the field.

2608. Pelletier, E. N., and Palmer, H. C.
Two new compounds as seed and soil treatments.
From abstr. in *Phytopathology*, 1960, **50**: 650-1.

Two dithiolone derivatives, 5-chloro-4-phenyl-1,2-dithiol-3-one and 5-chloro-4(p-tolyl)-1,2-dithiol-3-one, have a high degree of fungitoxicity and show particular promise as seed dressings and soil fungicides. In greenhouse foliage tests the compounds completely controlled tomato early and late blights at 0·2% concentration. In comparison with standard seed and soil treatments the compounds were effective for the protection of peas and cucumbers.

2609. Schroeder, W. T., and others.
Tomato disease control in relation to gallonage and fungicide applicators.
Plant Dis. Reptr, 1959, **43**: 719-24.

Field experiments over a period of 5 years and under disease conditions ranging from mild to severe indicated that comparable control of early blight [*Alternaria solani*] and anthracnose [*Colletotrichum phomoides*] of tomato was obtained with a hydraulic sprayer at rates of 50, 100 and 200 gal./acre, a commercial air-blast sprayer at 50 and 100 gal./acre, and an experimental concentrate type sprayer, the Cornell Row Mister III, at 20 gal./acre, provided that the fungicide dosage per acre was constant. Deposits and distribution of the fungicides by the spray machinery, determined by leaf print methods, supported the disease control data. [From authors' summary.]—N.Y. St. agric. Exp. Stat., Geneva.

2610. Stall, R. E.
Alteration of incidence of *Botrytis cinerea* on tomato by liming the soil.
From abstr. in *Phytopathology*, 1960, **50**: 655-6.

Highly significant differences were found in the incidence of grey mould on plants which grew on soil treated with 9,000, 3,000 and 600 lb. of hydrated lime per acre. Applied to a virgin fine sand of pH 4·3 these rates respectively resulted in pH values of about 7·0, 6·0 and 5·0. The amount of *Botrytis* fruit rot on the respective plots was 0·89, 2·31 and 9·16%. Foliage disease ratings were positively correlated with the incidence of fruit rot. No significant differences in disease development were observed in the same experiment, when plants were sprayed with a mixture of Cu, Zn, Fe and Mn, or with Mn alone. Vine vigour and yields were essentially the same with all the liming and microelement treatments.

2611. Termohlen, G. P.
De fysiologische specialisatie van *Cladosporium fulvum* en het kweken van tegen de bladvlekkenziekte resistente tomaterassen. **(The physiologic specialization of *Cladosporium fulvum* and breeding for leaf-mould resistance in tomatoes.)** [English summary 1 p.]
Tijdschr. PlZiekt., 1960, **66**: 314-27, bibl. 16, illus.

Progress in breeding leaf-mould-resistant varieties in the Netherlands is discussed. Work began in 1949 and is now being continued at the Experimental Station for Fruit and Vegetable Growing under Glass, Naaldwijk.

2612. Kennelly, A. G.
Combating leaf mould disease in glasshouse tomatoes.
N.Z. J. Agric., 1960, **101**: 363-5, bibl. 1, illus.

Thiram, salicylanilide, captan, copper oxychloride, zineb and Phygon recommended against *Cladosporium fulvum*, and varietal resistance discussed.

2613. Ebben, M. H.
Brown root rot of tomatoes. III. The bacterial flora of the rhizosphere.
Ann. appl. Biol., 1960, **48**: 817-23, bibl. 17.

An account of the behaviour of various types of bacteria in tomato-sick soil after steaming. [For parts I and II, see *H.A.*, 29: 3713 and 3714.]

2614. Knight, D. E., and Keyworth, W. G.
***Didymella* stem-rot of outdoor tomatoes. I. Studies on sources of infection and their elimination. II. Studies on chemical control.**
Ann. appl. Biol., 1960, **48**: 245-58, bibl. 30, and 259-69, bibl. 3.

I. The pathogen was found to infect and penetrate the seeds in diseased fruit without destroying their viability, and methods were devised for ridding the seeds of infection. It was not, however, possible to demonstrate the infection of mature plants from infected seed. It was found that the disease could be introduced on contaminated canes, in potting soil and from plant debris from the previous season's crop. The spread of the disease was encouraged by overhead irrigation. Tests of strains of various species of *Lycopersicon* showed that one line of *L. hirsutum* was highly resistant to stem and root infection, although another line was highly susceptible. II. The toxicity of a wide range of compounds to the fungus and to tomato plants was determined in the laboratory, and promising compounds were then tested in the field. There were two main test methods, in both of which the plants were infected artificially at various periods before or after treatment with the fungicides. Of the compounds tested maneb was the most successful, showing both eradicant and protectant properties at 1 and 2%. Captan (0·25 and 0·5%) was a good protectant but was less effective as an eradicant. [From authors' abstracts.]—Nat. Veg. Res. Stat., Wellesbourne.

2615. HACK, J., AND WILLIAMS, P. H.
The effect of certain soil treatments on *Didymella* stem-rot of tomatoes. II. Laboratory investigations.
Ann. appl. Biol., 1960, **48**: 236-44, bibl. 21.

About 93% of *Didymella lycopersici* spores were destroyed after 4 weeks' incubation in unsterilized soil. A survey of the microflora of glasshouse soil receiving different treatments and inoculated with *D. lycopersici* showed no clear relation between numbers of any group of organisms and the incidence of stem rot. Sterilized soil was not made toxic to *D. lycopersici* by the growth of a number of soil micro-organisms even after 9 months' incubation, but addition of unsterilized soil or of a suspension of unsterilized soil quickly restored toxicity. Direct observations of spores in soil on slides showed that their fate varied with the treatment of the soil before inoculation. Addition of glucose to unsterilized soil reduced its toxicity to *D. lycopersici.* Soils steamed for 1 minute or longer were not toxic to *D. lycopersici*, but soils steamed for very short periods were as toxic as unsterilized soils, although the soil microflora was much reduced. [From authors' abstract. For Part I, see *H.A.*, 27: 3591.]—Glasshouse Crops Res. Inst., Littlehampton.

2616. READ, W. H.
Studies on the prevention of basal attacks of tomato stem rot (*Didymella lycopersici*) with captan.
A.R. Glasshouse Crops Res. Inst. 1959, 1960, pp. 112-15, bibl. 3.

When it was applied to the lower portion of the stem and the surrounding soil, captan had a very marked effect in reducing the infection of tomatoes planted in infected soil. Applications of 3–5 oz. 0·25% captan were made 1 day before planting and again 25 days after planting. The pre-planting applications caused some leaf scorching and check to growth, and further tests are required before the treatment may be recommended.

2617. PROVVIDENTI, R., AND PENNISI, C.
La fusariosi del pomodoro in Sicilia e varietà resistenti alla malattia. **(*Fusarium* infection of tomatoes in Sicily, and varieties resistant to the disease.)**
Tecn. agric., 1960, **12**: 427-41, bibl. 16.

Until wilt-resistant varieties of tomato are more numerous and widespread, the pathogen (*Fusarium oxysporum* f. *lycopersici*) must be controlled by seed selection, seed disinfection, crop rotation, and (for glasshouse and choice varieties) by the use of fumigants. Brief descriptions are given of 24 wilt-resistant varieties.

2618. YOUSSEF, Y. A.
Antagonistic action of *Penicillium chrysogenum* in the control of tomato *Fusarium* wilt.
[German summary 8 lines.]
Phytopath. Z., 1960, **40**: 218-20, bibl. 4, illus.

The living organism or concentrations of a filtrate from broth cultures of *Penicillium chrysogenum* inhibited growth of *Fusarium oxysporum* in vitro. Symptoms of *Fusarium* wilt were also inhibited in tomato plants treated with cultures or filtrates of *P. chrysogenum.*—Univ. Ai'n Shams, Cairo.

2619. BUCHANAN-DAVIDSON, D. J., AND OTHERS.
Effect of synthetic polylysine on fungi.
Science, 1960, **132**: 1664-6, bibl. 8, illus.

The basic poly-α-amino acid, polylysine, was shown to inhibit *Fusarium oxysporum* f. *lycopersici* infection in tomato cuttings, but levels of polylysine above 100 μg./ml. were toxic to the tomatoes.—Univ. Wis., Madison.

2620. CORDEN, M. E., AND EDGINGTON, L. V.
A calcium requirement for growth regulator-induced resistance to *Fusarium* wilt of tomato.
Phytopathology, 1960, **50**: 625-6, bibl. 5, illus.

Resistance to wilt (*F. oxysporum* f. *lycopersici*) was induced by NAA only when Ca (200 p.p.m. or more) was supplied in the culture solution. Resistance was further enhanced by Ca levels higher than those necessary for normal growth. [For earlier work see *H.A.*, 29: 543 and 2582.]—Conn. agric. Exp. Stat., New Haven.

2621. BINDER, E., AND HUTCHINSON, M. T.
Further studies concerning the effect of the root-knot nematode *Meloidogyne incognita acrita* on the susceptibility of the Chesapeake tomato to *Fusarium* wilt.
Plant Dis. Reptr, 1959, **43**: 972-8, bibl. 23, illus.

The introduction of populations of *Meloidogyne incognita acrita* to the root area of tomato plants was followed by galling, but plant resistance to *Fusarium* wilt was not affected. Results were the same in conditions of normal nutrition or of K deficiency.—Rutgers Univ., New Brunswick, N.J.

2622. DIMOND, A. E., AND EDGINGTON, L. V.
Mechanics of water transport in healthy and *Fusarium*-wilted tomato plants.
Abstr. in *Phytopathology*, 1960, **50**: 634.

Successive wilting of leaves up the stem of *Fusarium*-infected tomato plants can be explained on hydraulic grounds alone. The lacunae of vessels in stems and petioles were measured to determine the conductive cross sections of individual vascular bundles. Flow rates in stems and petioles were obtained from the transpiration rates of leaves. Use of Poiseuille's, Ohm's and Kirchoff's laws led to rates of flow in individual vascular bundles of healthy and diseased tomato plants. *Fusarium* invades the roots and gradually grows up the stem, secreting plugging agents into vascular bundles. The main stem bundles are large and form a network of by-passes. Thus a unit amount of plugging produces only a small amount of dysfunction. When *Fusarium* decreases the effective radius of a large stem bundle by 50% over a distance of 2 nodes, the pressure must increase by only 3% to maintain the same water flow as in a healthy plant. Petiole bundles have no by-passes, and a 50% reduction in effective radius requires that the pressure be increased 1,600% for undiminished flow to leaf tissue. As a consequence the associated leaf tissue wilts, although water flow up the stem remains relatively undisturbed.

2623. Gaümann, E., Naef-Roth, S., and Kern, H.
Zur phytotoxischen Wirksamkeit der Enniatine. (**On the phytotoxic action of the enniatins.**) [English summary 6 lines.]
Phytopath. Z., 1960, **40**: 45-51, bibl. 12.

Baccatin A, consisting of a mixture of the enniatins A and B (toxins also produced separately by *Fusarium* spp.), is a metabolic product of *Gibberella baccata*, which has been shown to cause wilting in tomatoes. The combined enniatins A and B had a synergistic phytotoxic action.—Inst. spez. Bot., eidg. tech. Hochsch., Zürich.

2624. Wilson, J. B., and Gallegly, M. E.
Nutrition and environment in relation to development of late blight on resistant and susceptible varieties of tomatoes.
From abstr. in *Phytopathology*, 1960, **50**: 574.

Susceptibility increased as the balanced nutrient concentration of the medium was increased. All varieties became more resistant with age from 7 to 39 days after transplanting.

2625. Chitzanidis, A.
Untersuchungen über das Verhalten von Kartoffel- und Tomatenrassen der *Phytophthora infestans* (Mont.) de Bary gegenüber organischen und anorganischen Fungiziden. (**Studies on the response of potato and tomato races of *Phytophthora infestans* to organic and inorganic fungicides.**) [English summary ¾ p.]
Phytopath. Z., 1960, **40**: 1-34, bibl. 42, illus.

In field trials organic and inorganic fungicides proved equally effective in controlling *Phytophthora infestans* on tomatoes. Inoculations in the vicinity of Bonn showed that the potato races 0 and 4 of the fungus attack the fruits of tomatoes but not their foliage. These infections of the fruit occur much earlier than those due to the tomato races of late blight which attack both fruit and foliage.

2626. Crosse, R., and others.
Antifungal action of streptomycin-copper chelate against *Phytophthora infestans* on tomato (*Lycopersicon esculentum*).
Ann. appl. Biol., 1960, **48**: 270-8, bibl. 11.

The antifungal protection afforded by streptomycin-copper chelate *in vivo* in greenhouse tests against *P. infestans* on tomato was found to be of the order of 6 times greater than that of streptomycin sulphate. The copper chelate also showed much greater resistance to simulated rainfall. Similar tests showed that streptomycin-copper chelate (in terms of streptomycin content) was from 2½ to 5 times more effective as an antifungal prophylactic spray than zinc ethylene-bis(dithiocarbamate) (zineb), and some 50 times more active than copper oxychloride formulated as a commercial 50% w.p. These 3 materials showed roughly similar resistance to weathering by "rainfall", and it was assumed therefore that 250 i.u./ml. streptomycin as streptomycin-copper chelate might be expected to give the same degree of protection against *P. infestans* in the field as would the usual field rates of usage of zineb and copper oxychloride. [Authors' abstract.]—Glaxo Labs Ltd., Sefton Park, Stoke Poges, Bucks.

2627. Linnasalmi, A.
Tomaatin ruton kemiallinen torjunta. (**Chemical control of tomato late blight.**) [English summary 6 lines.]
Maatalous ja Koetoim., 1960, **14**: 208-12.

Fungicides which proved suitable for late blight control were a colloidal copper spray, captan and thiocarbamates. Sprays should be applied before infection starts and continued at 1-2-week intervals until harvesting has been completed.—Agric. Res. Centre, Tikkurila.

2628. Hayslip, N. C., and Stall, R. E.
Severity of tomato soil-rot caused by *Rhizoctonia solani* as influenced by former pasture crops.
Plant Dis. Reptr, 1959, **43**: 818-20, bibl. 2, illus.

Soil-rot of tomato fruit caused by *Rhizoctonia solani* was much less severe where Pensacola bahia grass or pangola grass alone had preceded the tomato crop than where these grasses had been grown in mixture with white Dutch clover.—Indian River Field Lab., Fort Pierce, Fla.

2629. Crossan, D. F., Morehart, A. L., and Johnson, W. H.
Laboratory, greenhouse, and field experimentation for control of *Rhizoctonia* fruit rot of tomato.
From abstr. in *Phytopathology*, 1960, **50**: 570.

A significant reduction in fruit loss was given by 2 lb. maneb plus 3 lb. tribasic copper sulphate.

2630. Young, P. A.

Controlling southern blight of tomato with chemicals and crop rotation.

From abstr. in *Phytopathology*, 1960, **50**: 578.

Plants with a ball of organic soil around the roots were used to test the effectiveness of several chemicals against *Sclerotium rolfsii.* Chemagro D-113, Vapam and Mylone gave good control of the blight. Terraclor raked into the soil at 516 lb. per acre gave excellent control but resulted in dwarf plants. Injecting Terraclor at 53 lb. per acre alongside the plants controlled the blight but temporarily decreased their yield. Four applications of 265 and 600 lb. calcium nitrate per acre did not control the fungus. A 6–8-year rotation consisting mainly of Bermuda grass, crab grass and rye almost completely controlled the fungus, when ragweed was removed by hoeing. The blight was very destructive following a maize or cotton rotation.

Tomatoes—pests.

(*See also* 1829, 2341, 2621, 2888, 3584.)

2631. Viglierchio, D. R., and Lownsbery, B. F.

The hatching response of *Meloidogyne* species to the emanations from the roots of germinating tomatoes.

Nematologica, 1960, **5**: 153-7, bibl. 8.

The larval hatch of *Meloidogyne hapla*, *M. incognita acrita* and *M. javanica* increased when egg masses were in close proximity to tomato roots; the emanation responsible has not yet been identified.

2632. Johnson, L. F.

Effect of the addition of organic amendments to soil on root knot of tomatoes. I. Preliminary report.

Plant Dis. Reptr, 1959, **43**: 1059-62, bibl. 7, illus.

Mature, dried crop residues (chopped to about $\frac{1}{8}$ in.) were incorporated in pots of soil infested with *Meloidogyne* sp. at rates of 0·5 to 1 lb. to 100 lb. soil (5 to 10 tons/acre), and tomato seedlings were planted at various times after soil inoculation. All the residues tested significantly reduced the number of nematode galls per plant, the effect generally becoming greater as the interval between incorporation and planting increased. A 95% reduction in gall number was obtained in soil with lespedeza hay added, when the tomatoes were planted after an interval of 30 weeks.—Univ. Tenn. agric. Exp. Stat., Knoxville.

2633. Bird, A. F.

The effect of some single element deficiencies on the growth of *Meloidogyne javanica.* [German summary 9 lines.]

Nematologica, 1960, **5**: 78-85, bibl. 13, illus.

It was found that *M. javanica* developed more rapidly on tomato plants deficient in a single major nutrient. The response was most marked when N was lacking, and less so in the absence of Mg, Fe and K. The probable cause of this response is discussed.—C.S.I.R.O., Merbein, Victoria.

2634. Maung, M. O., and Jenkins, W. R.

Effects of a root-knot nematode *Meloidogyne incognita acrita* Chitwood 1949 and a stubby-root nematode *Trichodorus christiei* Allen 1957 on the nutrient status of tomato, *Lycopersicon esculentum* hort. var. Chesapeake.

Plant Dis. Reptr, 1959, **43**: 791-6, bibl. 24.

A fuller account of work described in *H.A.*, 30: 796.

2635. N.S.W. Department of Agriculture, Entomological Branch.

Rogor 40 effective against pests of tomatoes.

Agric. Gaz. N.S.W., 1960, **71**: 174.

Control of fruit fly, tomato mite and green vegetable bug using Rogor 40 at 0·04%.

2636. N.S.W. Department of Agriculture, Entomological Branch.

Control of the tomato mite—*Vasates lycopersici.*

Agric. Gaz. N.S.W., 1960, **71**: 184 + coloured plate.

Using sulphur dust, lime-sulphur (4 fl. oz./2 gal.) or colloidal or dispersible sulphur (1 lb./40 gal.); DDT emulsion and Rogor 40 (1 fl. oz./6 gal.) have also given good control.

2637. Fjelddalen, J.

Tomat og krysantemum—nye vertplanter for skuddtoppmidd (*Hemitarsonemus latus* (Banks) Ewing). **(Tomato and chrysanthemum—new host plants for broad mite.)** [English summary $\frac{1}{2}$ p.]

Reprint from *Gartneryrket*, 1960, No. 8/9, pp. 120-3, bibl. 9, illus.

Excellent control was obtained with 2 applications of Kelthane or Thiodan at an interval of 8 days.

2638. Bertrand, P.

L'acariose bronzée de la tomate dans les maraîchages algérois. **(Tomato bronze mite in Algerian market gardening.)**

Rev. agric. A.F.N., No. 2134, reprinted in *Fruits et Prim.*, 1960, **30**: 155-6.

A description is given of *Phyllocoptes lycopersici* and the injuries it causes. Control measures are recommended. The tops of infested plants should be destroyed after harvesting. Crops should be rotated. Topping and disbudding should be avoided as much as possible in infested plants as these practices accelerate desiccation. The acaricides considered most suitable for Algeria are toxaphene (150 c.c. active ingredient per hl. or 8% dust), dichlorophenyltrichlorethanol (60 g. a.i. per hl.) and chlorobenzilate (35–40 c.c. a.i. per hl.), but parathion (20–25 g. a.i. per hl. or 1% dust) or malathion (150 c.c. a.i. per hl. or 3% dust) should be used when aphids are also present.

2639. ANON.
Tomato aphid control.
Banana Bull., 1960, **23**(7): 7.

Metasystox as a 0·05% spray (16 fl. oz. per 100 gal.) or phosdrin as a 0·025% spray (4 fl. oz. per 100 gal.), applied at 7- to 10-days intervals from the seed-bed stage onwards, have proved effective.

Tomatoes—fruit harvesting, grading, composition and storage.

(*See also* 2573.)

2640. RIES, S. K., AND STOUT, B. A.
Mechanical tomato harvesting in the United States.
Comm. Gr, 1960, No. 3383, pp. 965-9, illus.

Notes on types of machines in use.

2641. STOUT, B. A., AND RIES, S. K.
Development of a mechanical tomato harvester.
Agric. Engng, St. Joseph, Mich., 1960, **41**: 682-8, bibl. 4, illus.

See *H.A.*, 31: 836.

2642. U.S. DEP. AGRIC., AGRICULTURAL MARKETING SERVICE.
Handling tomatoes after a freeze.
Agric. Mktg, 1960, **5**(10): 16.

Harvesting should be delayed for a day and the fruit held for 3 days before grading to allow latent freeze and chilling damage to show. Tomatoes should not be shipped if freezing injury is present or if they have been subjected to average daily temperatures below 50° F. for a week.

2643. WINSOR, G. W.
A note on the grading of unevenly coloured tomato fruit from the manurial trials during 1959.
A.R. Glasshouse Crops Res. Inst. 1959, 1960, pp. 83-8, bibl. 2.

An experimental grading scheme is described in which unevenly coloured fruit is subdivided into 28 main categories. The main subdivisions are for "blotchy" fruit, "hard top", general pale top and "waxy" fruit, these being further subdivided as to severity and position of the defect. "Blotchy" fruit is defined as fruit showing delimited areas of uneven colour, and this was found to be more common near the calyx, and more prevalent with a low level of K. "Hard top" refers to fruit with areas of hard tissue round the calyx; this defect was also more prevalent with low K. "Hard top" was more prevalent in plants exposed to full sunlight than in shaded plants, whereas the occurrence of "blotchy" and "waxy" fruit was not apparently affected by light intensity.

2644. COOPER, A. J.
The effects of the size, position and maturation period of inflorescences and fruits on abnormal pigmentation in the tomato variety Potentate.
Ann. appl. Biol., 1960, **48**: 230-5, bibl. 2.

A modification to an earlier classification of pigmentation abnormalities [see *H.A.*, 29: 2592], enabling it to be used for varieties other than Potentate, is discussed. It is shown for Potentate that the proportion of fruits giving uniform ripening colour declines with increasing fruit weight, while the proportion of Grade C fruits steadily increases. The occurrence of Grade A fruits, however, is maximal in fruits of 80 to 120 g. The occurrence of pigmentation abnormalities was shown to be independent of the length of the maturation period of the fruit. It was found that Grade A fruits occurred with greater frequency in fruits developing on upper inflorescences, while Grade C fruits occurred more frequently on lower inflorescences. The number of fruits in an inflorescence was shown to have no consistent relation to pigmentation abnormalities, nor was there any relation between pigmentation and the position of fruits within the inflorescence. Frequent examples of an antithetic relation between the occurrence of Grades A and C symptoms are noted, suggesting that conditions that are favourable for the development of the one are unfavourable for the development of the other. [Author's abstract].—Glasshouse Crops Res. Inst., Littlehampton.

2645. MOHR, W. P.
Tomato pH survey.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 24.

The critical pH of the fruit, above which the spoilage hazard in canned tomatoes is considerable, was found to be 4·5. The pH was found to increase as the canning season advanced in all varieties except John Baer. Abnormally high figures were found in fruits damaged by sun scald.—Cent. exp. Farm, Ottawa.

2646. FREEMAN, J. A.
Chemical constituents and respiration associated with quality of tomato fruits during maturation and ripening.
Diss. Abstr., 1960, **21**: 408, being *L.C. Card No. Mic.* 60-2702 of 103 pp.

Total acidity in tomato fruit increased from the pre-mature stage to a peak soon after maturation, and then decreased with ripening. Total sugars and total soluble solids increased only slightly from the turning stage to the red ripe stage. Carotenoids increased with ripening, but ascorbic acid did not necessarily increase directly with ripening. Storage-ripened fruit was generally higher in total acids and lower in ascorbic acid, total sugars, total soluble solids and sugar/acid ratio than vine-ripened fruit.

Maturation and ripening had a marked effect on the relative amounts of free amino acids in tomato fruits, although the total amino-acid pool remained relatively constant throughout all stages of development. Respiration studies showed that the climacteric peak in vine-ripened fruit was reached at the just turning stage; in storage-ripened fruit the climacteric peak occurred later, at about 50% to 80% pink. The intensity of the climacteric peak was higher in vine-ripened than in storage-ripened fruits, although there was no difference in respiration rates of red ripe fruits ripened on the vine or in storage. It was observed that fruit quality was affected by truss position. Total acids, total amino acids, respiration rate and the climacteric peak decreased, while ascorbic acid and the sugar/acid ratio increased, with ascending truss position.—Wash. St. Univ.

2647. DOYLE, W. P., HUFF, R., AND WANG, C. H.
Role of glyoxylate in biosynthesis of acids in tomato fruit.
Plant Physiol., 1960, **35**: 745-50, bibl. 21.

Radiorespirometric and incorporation studies of glyoxylate metabolism showed that glyoxylate can participate in respiratory functions, that glycine and serine may be synthesized from glyoxylate, that glyoxylate can be incorporated extensively into the carbohydrates, and that the occurrence of the malate synthetase reaction in tomatoes is indicated by the incorporation of glyoxylate into the malate molecules. [From authors' summary.]—Ore. St. Coll., Corvallis.

2648. DOYLE, W. P., AND WANG, C. H.
Radiorespirometric studies of glucose catabolism in tomato fruit.
Plant Physiol., 1960, **35**: 751-6, bibl. 15.

When C^{14}-labelled glucose was introduced into tomato fruit the amount of fruit glucose in the immediate infiltrated area was determined. The substrate glucose infiltrated into a well defined area. Several key assumptions necessary for deriving the equation for the estimation of glucose catabolism have been verified by a series of radiorespirometric experiments using C^{14} specifically labelled acetate, pyruvate and gluconate as test substrates. [From authors' summary.]—Ore. St. Coll., Corvallis.

2649. THOMPSON, G. A., JR., PURCELL, A. E., AND BONNER, J.
A carotene precursor: its proposed structure and place in biosynthetic sequence.
Plant Physiol., 1960, **35**: 678-82, bibl. 9.

A substance has been isolated from tomatoes which appears to be an intermediate in the pathway from mevalonic acid to the carotenes [see also *H.A.*, 29: 523]. The results of infrared spectroscopy and degradative studies indicate a probable structure of 3,7,11,15-tetramethylhexadeca-1,3,6,10,14 pentaene. [Authors' summary.]—Calif. Inst. Tech., Pasadena.

2650. EAVES, C. A.
Storage of tomatoes in controlled atmospheres.
Rep. Canad. Cttee Fruit Veg. Pres. 1959, 1960, p. 2.

Tomatoes, variety Scotian, were stored in gastight cabinets at 55° F. in atmospheres containing 2·5, 5 and 10% O_2, with and without 5% CO_2. The CO_2 retarded ripening and rotting markedly, irrespective of the O_2 concentration. A reduction in the O_2 level without CO_2 also retarded ripening but did not influence rotting. The slowest ripening occurred with 5% CO_2 and 2·5% O_2.—Kentville Res. Stat., N.S.

Sundry crops.

(*See also* 3220.)

2651. SINGH, S. R.
The Hawaiian beet web-worm (*Hymenia recurvalis* F.), a serious pest of Indian spinach (*Amaranthus viridis* Linn.).
Agric. J. Dep. Agric. Fiji, 1960, **30**: 35-8, bibl. 8, illus.

The life history of the moth is described, with a note on its natural enemies. For control 2% DDT dust was effective.

2652. IMAZU, T., AND OSAWA, T.
Studies on udo, *Aralia cordata* Thunb. IV. Dormancy of udo buds with regard to its variation among domestic and wild udoes.
[Japanese, with English summary 14 lines.]
J. hort. Ass. Japan, 1960, **29**: 126-8, bibl. 5.

No relationship between the degree of dormancy and latitude or altitude could be found in wild udoes. The dormancy in cultivated udoes, however, was found to be weaker. [For part III, see *H.A.*, 31: 842.]

2653. SHIMOKAWA, M., AND ADACHI, K.
Effect of gibberellin on the growth of blanched mitsuba (*Cryptotaenia japonica*). [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 48-53, bibl. 8, illus.

In treatments with gibberellin at 25, 50 and 100 p.p.m. maximum elongation was obtained with the 100 p.p.m. solution and the least with 25 p.p.m. The effect was greater, the earlier the treatment and the greater the number of applications. The number and size of petioles were not affected by treatment and bolting was not observed. Leaflets on the treated plants were smaller and their petiolets very much elongated. [*Cryptotaenia japonica* (*C. canadensis*) is an aromatic umbelliferous plant, known as honewort in North America. In Japan it is cultivated as a vegetable, both the tops and roots being eaten.—Ed.]

TOBACCO.

General.

(*See also* 3223, 3561, 3563.)

2654. CORESTA.
Symposium—Istanbul 1960.
CORESTA Inf. Bull., 1960, No. 3, pp. 13-34 [English and French].

The subject of the symposium held in August, 1960, at Istanbul by CORESTA was as follows: "Objective evaluation of the natural or controlled evolution of tobacco from harvesting to utilization; physical, chemical and biological methods; characteristic indices; correlation with quality." Some 22 papers delivered at the symposium are summarized in this number of CORESTA. They deal mainly with maturity, fermentation, quality studies and the effects of environmental factors during the growth of the crop on the product.

2655. Camerani, V., and Fernandez, A.
La situazione attuale della bibliografia del tabacco. (**The present position as regards tobacco bibliography.**)
Tabacco, 1960, **64**: 194-9, bibl. 47.

A list of bibliographies with an informatory introduction.

2656. Patel, M. S., and Pillai, P. N. B.
Tobacco in Ceylon.
Indian Tobacco, 1960, **10**: 89-100, illus.

Notes on culture, with production figures.

2657. Younge, O. R., and Fukunaga, E. T.
Cigar wrapper tobacco production in Kona.
Hawaii Fm Sci., 1960, **9**(1): 4-5, illus.

Results of growing 12 wrapper tobacco selections at sites ranging from the dry lower edge of the coffee belt at 700 ft. to the moist upper limits at 2,300 ft. showed that the lower levels were too dry and the higher levels too wet for high quality tobacco production, although wind protection was adequate. Cloth for shading was not necessary owing to the prevailing high R.H. and partial cloudiness, but controlled heating and R.H. appeared essential for curing leaf of acceptable quality. The best quality tobacco was produced at altitudes between 1,000 and 1,800 ft.

2658. Gupta, P. S., Shukla, T. N., and Singh, M.
Cultivation of chewing tobacco in U.P.
Indian Tobacco, 1960, **10**: 101-4.

Varieties, cultural methods, economics.

2659. Patel, G. C., Das, R., and Singh, M.
Towards bigger and better crop of Motihari tobacco.
Indian Tobacco, 1960, **10**: 163-4, illus.

Advice on growing *N. rustica* tobacco.

2660. Hoyle, S. T.
Burley tobacco.
Nyasaland Fmr For., 1957, **4**(1): 15-19, [received 1960].

Notes on growing, curing and grading.

2661. Tobacco Research Board of Rhodesia and Nyasaland.
The production of Turkish tobacco.
Bull. Tob. Res. Bd Rhod. Nyasa. **8**, 1960, pp. 27, illus.

The subjects discussed include seed-bed management; varieties (Soluk and Samsun); rotations; field preparation (including soils and ploughing); fertilization (200–400 lb. per acre of 2–18–15 plus Mg); cultural practices (planting date, spacing, transplanting, pest and disease control); harvesting; curing.

2662. Davitashvili, M.
Soviet Georgian tobacco.
Indian Tobacco, 1960, **10**: 169-70, illus.

Notes on cultural methods used for samsun and trebizond types.

Breeding and varieties.

(*See also* 2696, 2727, 2728, 2733, 3565, 3594.)

2663. Burbidge, N. T.
The Australian species of *Nicotiana* L. (Solanaceae).
Aust. J. Bot., 1960, **8**: 342-80, bibl. 6, + 20 plates.

Morphological characters of diagnostic significance discussed and 5 new species and 2 new subspecies described.

2664. Valleau, W. D.
Variegation I—a dominant mutation in burley tobacco.
Tobacco, N.Y., 1960, **151**(11): 33-6, bibl. 2, illus.

From a group of narrow leaved chlorotic plants one developed with leaves either half green and half white or variegated. The breeding behaviour of the mutant is discussed.—Agric. Exp. Stat., Lexington, Ky.

2665. Wolf, F. A.
A heritable leaf malformation of tobacco.
Tobacco, N.Y., 1960, **151**(8): 21-3, bibl. 9, illus.

The malformation appeared in hybrids of Dixie Bright 102, Smyrna and Guacharo, and has been noted as occurring spontaneously for 30 years. In crosses between normal plants and plants with malformed leaves the ratio of normal to abnormal plants in the F_2 was 3 : 1.

2666. Ramamurthi, T. G.
Morphological features of meenampalayam tobacco.
Madras agric. J., 1960, **47**: 178-9.

Descriptions of 2 varieties used for chewing.

2667. Georgievski, K.
The tobacco variety Djebelska Basma and its main characteristics. [Serbian.]
Duvan, 1959, **9**: 185-95, from *CORESTA Inf. Bull.*, 1960, No. 2, Abstr. 3704.

Growth characteristics and chemical composition.

2668. Terent'eva, A. I.
The new tobacco variety Trebizond 3072. [Russian.]
Tabak, 1960, **21**(4): 46-8.

Bears up to 40–43 leaves and shows resistance to mosaic and powdery mildew.

Seeds and seed-beds.

(*See also* 2735.)

2669. Steinberg, R. A.
Production and germination of *Nicotiana* seed grown under various greenhouse conditions.
Tobacco, N.Y., 1960, **151**(21): 19-22, bibl. 2.

Poor and erratic germination of freshly harvested seed of 57 species was found to be due to dormancy, which decreased greatly, with an increase in germination percentage, in seed stored for 3–4 years at 50° F. Varying the conditions of growth had a marked influence on the degree of dormancy in fresh seed, but these differences disappeared during storage.—U.S.D.A., Beltsville, Md.

2670. Hashimoto, T., and Yamaki, T.
On the physiological effect of gibberellins A_1, A_2, A_3 and A_4.
Bot. Mag., Japan, 1959, **72**: 178, from *CORESTA Inf. Bull.*, 1960, No. 2, Abstr. 3658.

Effective concentrations of GA to promote 20% germination of tobacco seeds in the dark [see *H.A.*, 30: 810] are: A_1, 10^{-4}; A_2, 3×10^{-4}; A_3, 10^{-4}; and A_4, 2×10^{-6}.

2671. Baker, A. E.
Tobacco seed-bed management.
J. Agric. W. Aust., 1960, **1**: 713-15, illus.

Soil preparation, fertilization, seeding, watering and disease control, and growth of seedlings discussed.

2672. Merker, J.
Der Einfluss der Desinfektion des Bodens auf die mikrobiologischen Eigenschaften sowie auf Entwicklung, Ertrag und chemische Zusammensetzung des Tabaks. (**The influence of soil sterilization on the microbiological characters, as well as on growth, yield and chemical composition of tobacco.**) [Russian and English summaries ½ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1960, **7**: 7-39, bibl. 33, illus.

Soil steaming was followed by only small changes in the chemical composition of the soil, namely reduced acidity combined with reduced fixation of soluble phosphoric acid, and increases in lactate-soluble K_2O and ammonium N. Soil respiration (an expression of the decomposition of organic matter by micro-organisms) was increased by steaming, but reduced by formalin treatment. Nitrification was depressed by soil sterilization, the degree of depression depending on soil type. Following the use of calcium cyanamide, ammonification, but not nitrification, occurred in the first 8 weeks. The growth and development of tobacco plants was accelerated in steamed soil by comparison with untreated soil. Leaf yield and total plant weight were markedly increased in steamed soil. Changes in the chemical composition of tobacco attributable to soil steaming were insignificant. Leaf N uptake was about 30% higher from steamed soils than from untreated soils.

2673. Vorster, S. F.
Keep tobacco seedbeds free of weeds.
Fmg S. Afr., **36**(6): 9-10, illus.

In an experiment to compare 7 methods of weed control in seed-beds chloropicrin was the most effective but is expensive. Methyl bromide was fairly effective, as were steaming and burning.—Stellenbosch-Elsenburg Coll. Agric.

2674. Fatus, G. K., Matveenko, T. M., and Vovnjanko, M. T.
The use of herbicides for weed control. [Russian.]
Tabak, 1960, **21**(4): 41-4.

DCU, propham, sodium TCA, 2,4-D (sodium salt) and MCPA (sodium salt) were used in several experiments for weed control in frame-grown tobacco seedlings. The most effective control of both grassy and broad-leaved weeds was obtained with 10 g. DCU + 3 g. 2,4-D or 10 g. DCU + 3 g. MCPA per cu. m. of soil applied 30 days before sowing. Seedling stand was greatly improved, and when 30 g. of DNOC per cu. m. were added to these herbicides the chlamydospores of black root rot were also destroyed. The herbicides did not affect the soil structure and are considered better and cheaper than steam sterilization.

2675. Popovic, R.
Plastic materials as covers for tobacco seed-beds. [Serbo-Croatian.]
Duvan, 1960, **10**: 65-76, illus., from *Tob. Abstr.*, 1960, **4**, Abstr. 1602.

Seedlings from seed-beds covered with polythene and glass frames reached the transplanting stage 14–15 days earlier than those from uncovered beds or from beds covered with reed mats. Seedlings from hot-beds covered with polythene and glass reached the transplanting stage 9 days earlier than those protected with reed mats. Hot-beds covered with polythene and glass produced 22–33% more seedlings per sq. m. than semi-hot-beds covered with reed mats. Fewer seedlings were infected by root rot in seed-beds covered with polythene and polyvinyl than in uncovered and reed-covered beds.

2676. Curcumija, T. L.
The use of micronutrients for raising tobacco seedlings. [Russian.]
Tabak, 1960, **21**(4): 45-6.

When Mn, Cu, Zn, B and Mo were added to the seed-bed soil in frames, the most effective proved to be Mo as ammonium molybdate at 0·712 g. per sq. m.; this consistently increased the number of transplantable seedlings by 14–27%.

2677. Vlasiuk, P. A., and Darmenko, M. S.
Dusting seeds with minor element salts before planting. [Ukrainian.]
Dop. Ukrainsk. Akad. S.G. Nauk, 1959, **2**(3): 3-6, and *Ref. Doc. Tehn. Bucuresti*, 1959, **11**(11): 20-30, from *CORESTA Inf. Bull.*, 1960, No. 2, Abstr. 3776.

Seeds of various crops (notably tobacco) benefited from dusting with trace elements (Mn, Zn and Cu sulphates, boric acid, aluminium nitrate and ammonium molybdate) combined with fungicides in talc. The use of minor elements in solutions was less beneficial.

2678. Wittmer, G.
Attività citologica dell'olio estratto da semi vecchi e freschi di *Nicotiana rustica.* **(Cytological activity of the oil extracted from old and fresh seeds of *Nicotiana rustica*.)** [English summary ¾ p.]
Tabacco, 1960, **64**: 172-93, bibl. 34, illus.

Tests with onion root tips showed that the toxicity of the oil from fresh seeds to the chromosomes (causing breakage and other aberrations) was greater than that of oil from seeds stored for 10 years. In both cases the mutagenic capacity varied inversely with the concentration. [For earlier studies, see *H.A.*, 29: 3759.]

Planting and cultivation.

2679. Patel, G. C., Awatramani, N. A., and Prasad, D. V. V.
Preparatory tillage studies in flue-cured tobacco.
Indian Tobacco, 1960, **10**: 117-23, bibl. 9.

In one experiment on a heavy black soil repeated ploughings with a mouldboard plough adversely affected yield and quality. In a second experiment, with 9 combinations of ploughings and harrowings, one ploughing followed by 4 harrowings provided sufficient preparatory tillage.—Cent. Tob. Res. Inst., Rajahmundry.

2680. Nor, M. I., and Šakurov, I. F.
The planting machine SRN-2M. [Russian.]
Tabak, 1960, **21**(4): 39-41, illus.

Description of a tractor-drawn planter handling 4,000–5,000 tobacco plants per hour.

2681. Hornung, H.
Über Standweitenversuche mit verschiedenen Tabaksorten im Jahre 1959. **(Plant spacing trials with different tobacco varieties in 1959.)**
Dtsch. Tabakbau, 1960, **40**: 81-3, from *Tob. Abstr.*, 1960, **4**, Abstr. 1099.

The cigar varieties Havanna II/c and Geudertheimer III and the cigarette varieties Virgin 230 and 232 were grown at spacings of 62·5 × 40, 62·5 × 60 and 62·5 × 80 cm. The widest spacing resulted in better colour, leaf size and weight, structure, elasticity and consistency, burn, aroma and taste. Nicotine and sugar contents increased slightly. The closest spacing resulted in the greatest labour saving during transplanting, topping, suckering, harvesting and sorting.

2682. Shah, V. H., and Patel, R. M.
Desirability or otherwise of interculturing in row crops.
Indian J. agric. Sci., 1959 (issued 1960), **29**: 1-9, bibl. 21.

In rain-grown tobacco inter-row cultivation at 10-day intervals tended to reduce yields and nicotine content compared with no cultivation, and the cash return from the latter was greater. Similar results were obtained with brinjals [eggplants] grown under irrigation. The reduction of cultivation during growth to a minimum consistent with weed control is recommended.—Inst. Agric., Anand, Bombay.

Climate and irrigation.

(*See also* 2657, 2690, 2720.)

2683. Robertson, G. W.
Weather and the growing of tobacco.
Lighter, 1960, **30**(3): 21-7, bibl. 10.

The weather conditions favourable for tobacco growing in Quebec are: a mild sunny April and May with no frost after 20 May, followed by warm sunny weather and less than 1 in. of rain until 10 June; from 10 June to the end of August showers once or twice a week giving 1–1¼ in. per week, and warm sunny weather; dry warm weather for the harvest and no frost before 25 September.—Plant Res. Inst., Ottawa.

2684. FERGUSON, T. P.
Studies in the growing of flue-cured tobacco. II. Some preliminary observations on the influence of temperature and light on the growth and quality of tobacco.
Tobacco, N.Y., 1960, **151**(6): 19-23, bibl. 9.

It was found possible to obtain good quality cured leaf from Hicks and D.B.244 grown under completely artificial conditions in sand cultures, but both light intensity and night temperature had a marked effect on quality. [For part I, see *H.A.*, 31: 874.]—Imp. Tob. Co. Ltd., Bristol.

2685. DE BEER, J.
Excessive irrigation does not benefit tobacco.
Fmg S. Afr., 1960, **36**(7): 41-3.

Flue-cured tobacco was irrigated (*a*) when 25% of the available soil moisture had been used up, (*b*) when 75% of the available soil moisture had been used up, and (*c*) at wilting point. Results showed that the leaves of plants in treatment (*c*) had the highest N, P_2O_5 and nicotine contents.—Cent. Tob. Res. Stat., Rustenburg.

Nutrition and mineral composition.

(*See also* 1710, 1718, 2332, 2672, 2676, 2677, 2714, 2724, 3570.)

2686. RICHARD, J.
Soil fertilization for flue-cured tobacco in Quebec.
Lighter, 1960, **30**(3): 18-20.

Stresses the importance of organic matter and the need for K and P to assist ripening and quality.

2687. HIBON, J.
La fertilisation du sol des plantations de tabac à fumer. **(The fertilization of smoking tobacco crops.)**
Bull. afr. Corps Gras, reprinted in *Fruits et Prim.*, 1960, **30**: 161-2.

Recommended fertilizer practices for Morocco.

2688. ANON.
Fertilización del tobaco negro. (**Manuring dark tobacco.**)
Agric. venezol., 1960, **23**(217): 20, illus.

A 6–12–12 formula gave good results in the Táriba district, the yield being 1,305 kg. per ha. compared with 903 kg. in the unmanured control.

2689. PEARSE, H. L.
Growth conditions and the characteristics of cured tobacco leaves. I. The influence of modified nutrition at different growth stages on the growth of plants and leaves. [French and Afrikaans summaries ½ p. each.]
S. Afr. J. agric. Sci., 1960, **3**: 197-207, bibl. 4.

Hybrids of Vamorr × Yellow Mammoth were grown under glass in a mixture of sand and vermiculite by the constant drip nutrient solution technique, the nutrient solution being replaced by distilled water at various growth stages. The time of onset of partial starvation had no effect on height, growth or rate of initiation of new leaves, but leaf size was greatly increased by prolonged feeding. Leaves of all the series cured satisfactorily.—Cent. Tob. Res. Inst., Rustenburg.

2690. ANON.
Chemical composition of Turkish tobacco.
Fmg S. Afr., 1960, **36**(7): 21, 32, illus.

Analyses of commercial grades of 240 different crops and of experimental Turkish tobacco cultivated under both irrigated and dry conditions showed that the nicotine content, and to a lesser extent the N and sugar contents, were higher in dry land crops, whereas the P and K contents were somewhat higher in irrigated crops. The Ca and Mg contents were similar in both types of crop. A low nicotine content in commercial crops was thought to be due to failure to harvest the upper leaves.

2691. PATEL, G. J., PATEL, U. R., AND PATEL, B. A.
Effect of placement of manure on bidi tobacco crop.
Indian Tobacco, 1960, **10**: 105-15, bibl. 5.

Broadcasting N fertilizer at 160 lb. N per acre resulted in more vigorous initial growth than placement of 100, 160 or 200 lb. N per acre at depths of 2–3 or 4–5 inches, but after topping the plants that had received placed N overtook the controls and produced greater yields. No differences were observed in the responses to placement of N at different depths.—Inst. Agric., Anand.

2692. TAKAHASHI, T., AND YOSHIDA, D.
Studies on the absorption of nitrate and ammonium nitrogen by the tobacco plant. I. Effect of pH of the culture solution.
J. Sci. Soil, Tokyo, 1958, **29**: 200-4, from *CORESTA Inf. Bull.*, 1960, No. 2, Abstr. 3674.

Variations in pH were found to have little effect on absorption and on the growth of tobacco plants cultured in a medium containing NO_3. In cultures containing NH_4 a lowering of the pH hindered absorption and plant growth; NH_4 toxicity symptoms appeared and the concentration of lower molecular N compounds (NH_4-N, amphorite adsorbed NH_4 and asparagine) increased, although raising the level of the 2 latter compounds seemed to reduce the toxicity of NH_4. In the NH_4 cultures increasing the acidity fostered degradation of the carbohydrates, while an increase in alkalinity resulted in a higher level of mineral elements in the plant.

2693. Yoshida, D., and Takahashi, T.
Influences of nitrogen nutrition on nicotine synthesis in tobacco plant.
Soil and Plant Food, 1960, **6**: 1-6, bibl. 5.

More N was absorbed by tobacco plants with increased application of urea, and at all levels applied absorption reached a peak 50–60 days after transplanting and then declined rapidly. The nicotine content of the leaf was not affected until after topping, when it showed a sharp increase. At the same time leaf N was translocated to the stem and roots. High N applications had a greater effect on the nicotine content than on the N content of the flue-cured leaf. Chlorogenic acid contents decreased with an increased N supply and were negatively correlated with nicotine contents.—Hatano Tob. Exp. Stat.

2694. Wedin, W. F.
Yield and quality of cigar-type tobacco in relation to potash and nitrogen fertilization.
Tobacco, N.Y., 1960, **151**(13): 19-23, bibl. 13.

On a soil of low fertility the application of K significantly increased yield and quality, the carbonate being the most effective, followed by the sulphate and nitrate. On a highly fertile soil only the increase in leaf burn was significant. N applications to the poor soil increased yield, quality and leaf burn significantly. When N was applied to the fertile soil yield increases were also significant and the improvement in quality highly so.—Wis. agric. Exp. Stat., Madison.

2695. McCants, C. B.
Response of flue-cured tobacco to potassium nitrate and other sources of potassium and nitrogen.
Tobacco, N.Y., 1960, **151**(23): 21-7, bibl. 4.

Pre-planting applications of different rates of K as KNO_3, KNO_3 + KCl, and K_2SO_4 + KCl were compared and also side-dressings of K and N obtained from KNO_3, $(NH_4)_2SO_4 + K_2SO_4$, and $NH_4NO_2 + K_2SO_4$. Maximum yield increase was obtained with 50 lb. of K_2O per acre, and, provided the Cl content was held constant, the source of K was immaterial. In fumigated soil given a pre-planting dressing of $(NH_4)_2SO_4$ a side dressing of KNO_3 was the most effective, but where the pre-planting treatment was KNO_3 the differences between the side dressings were smaller and less consistent.—N.C. agric. Exp. Stat., Raleigh.

2696. Bortner, C. E., Wallace, A. M., and Hamilton, J. L.
Differences in potassium, nitrogen and total alkaloid concentration of ten burley tobacco varieties.
Tobacco, N.Y., 1960, **151**(4): 19-24, bibl. 3.

Although variations in the K, N and total alkaloid contents of 3 commercial varieties and 7 experimental lines of burley tobacco grown at 2 places were found to be varietal, in the drier site the K content of the leafweb decreased from the bottom to the top of the plant and the reverse was found in the site with higher rainfall. In all varieties at both places the N content increased from the bottom to the top of the plant, but there was no correlation between N content, yield and total alkaloid content.—U.S.D.A. and Univ. Ky, Lexington.

2697. Takahashi, T., and Yoshida, D.
Fractionation of foliar absorbed phosphorus by paper electrophoresis.
Soil and Plant Food, 1958, **4**: 32-6, bibl. 8.

Absorption of foliar applied P by tobacco plants was greater in the upper leaves and was increased by the addition of glycerine to the spray. With P-deficient plants the percentage of P absorbed was higher but the ratio of inorganic to organic P in the leaves was lower.—Hatano Tob. Exp. Stat.

2698. Anon.
Deficiencia de potasio en tabaco. (**Potassium deficiency in tobacco.**)
Not. agric. Serv. Shell Agric., Venezuela, 1960, **2**: 86-7, illus.

The deficiency threshold for K in tobacco is indicated by a foliar K content of 2·5%. If the soil is deficient in K, it should be supplied with 300–1,000 kg. of potassium sulphate per ha. before transplanting, the lower rates being generally adequate for the lighter soils. For good utilization of K the heavy soils must be loosened between the rows after irrigation.

2699. Nelson, R. A.
Potentiometric determination of the chloride content of tobacco.
J. Ass. off. agric. Chem., Wash., 1960, **43**: 518, bibl. 3.

Compared with the gravimetric method the potentiometric titration of the aqueous acid solution with silver nitrate solution gave much more rapid and equally accurate results.

2700. Fowler, H. D.
Variations in scopoletin in leaves in relation to chloride treatment of tobacco.
Nature, 1960, **188**: 1044-5, bibl. 8.

Hicks tobacco, grown in sand in a glasshouse, was supplied with sodium chloride at various levels from 0·5–6·0 m.e./l. Increased chloride in the leaves resulted in increased scopoletin, and this may account for the typical morphological changes known to be caused by high NaCl concentrations, the scopoletin affecting the metabolism of IAA. Scopoletin, associated with high NaCl, may also be a factor in quality changes. Low K also appears to favour scopoletin accumulation.—Dep. Agric., Perth, W. Aust.

2701. SHIROYA, T.
The formation of phenolase in the leaves of tobacco plant.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xiii.

Leaves of the variety Bright Yellow grown in a Cu-deficient solution showed very low (4–10% of normal) phenolase activity. The addition of Cu to the solution of Cu-deficient plants increased the phenolase activity, especially in young leaves on the upper part of the stem.—Queen's Univ., Kingston, Ont.

Growth and morphology.

2702. SUGGS, C. W., BEEMAN, J. F., AND SPLINTER, W. E.
Physical properties of green Virginia-type tobacco leaves. Part III. Relation of leaf length and width to area.
Tobacco, N.Y., 1960, **151**(16): 19-23, bibl. 6.

The length, width and area of green bright leaf tobacco leaves were measured in 4 varieties grown at 2 spacings and at 8 soil moisture levels. For all except very small leaves the area was found to equal 0·6345 of the product of the length and width. Varietal and irrigational treatment differences were not significant. [For part II, see *H.A.*, 31: 882.]—N.C. St. Coll., Raleigh.

2703. ENDEMANN, W.
Das Flächengewicht des Tabakblattes. **(Weight per unit area of tobacco leaves.)** [Russian and English summaries ⅓ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1960, **7**: 40-56, bibl. 15.

The physical characteristics of tobacco leaves are discussed, and it is considered that weight per unit area is the most important of them. On the basis of available data on East German tobaccos, it was calculated that one third of the increase in the weight per unit area could be accounted for by an increase in the weight per unit volume, while the remaining two thirds of the increase in weight per unit area were due to increased thickness of the leaf. The relative effects of variety and environment on weight per unit area were assessed at: climate 50%, variety 30% and soil 20%.

2704. WELLENSIEK, S. J.
Stem elongation and flower initiation.
Proc. Akad. Wetensch. Ser. C, 1960, **63**: 159-66, illus., from *Tob. Abstr.*, 1960, 4, Abstr. 1589.

In long day conditions a considerable stem elongation of Maryland Mammoth tobacco could be obtained by GA treatment. After transfer to short day conditions 1 control plant formed flower buds after 54 days, whereas 2 plants treated with GA did not do so until after 71 days. Hence stem elongation would appear to have retarded flower bud initiation. Treatments with 100 p.p.m. GA were applied once a week for 4, 5 or 6 weeks. After 4 weeks of treatment, followed by short days, the flower buds in the GA plants were retarded by not less than 34·8 days. After 5 and 6 weeks of treatment the period of retardation declined to 22·8 and 4·9 days, respectively.

2705. BONNAND, J.
Étude de l'inflorescence de *Nicotiana glutinosa.* **(A study of the inflorescence of *Nicotiana glutinosa.*)**
C.R. Acad. Sci., Paris, 1960, **250**: 1531-3, from *CORESTA Inf. Bull.*, 1960, No. 2, Abstr. 3654.

Developmental morphology.

Physiology and biochemistry.

(*See also* 1710, 1731, 1775, 1784, 1857, 2692, 2693, 2700, 2701, 2732, 3565, 3578.)

2706. YAGER, R. E.
Some effects of leaves and indoleacetic acid upon floral abscission in *Nicotiana tabacum.*
Bot. Gaz., 1960, **121**: 244-9, bibl. 16.

Leaves were removed from different positions on the stems of 2 tobacco varieties, and the effect upon floral abscission was observed. In other experiments the flower was removed to determine its effect upon the abscission of the remaining pedicel. IAA in lanolin was added to the nodes where leaves had been excised and also to the pedicel stubs. The removal of upper leaves reduced the number of days to abscission of unfertilized ovaries. The removal of lower leaves caused little variation in the time of abscission. The area of the leaves removed had little effect upon abscission; the nodal position of the leaves removed was more important. The shorter abscission time following the removal of upper leaves was altered by the application of IAA in lanolin to the exposed nodes. This effect was proportional to the concentration applied. High concentrations (1,000 and 10,000 p.p.m.) of IAA added at the nodes can retard abscission for a longer time than the upper leaves do normally. Removal of the ovaries resulted in much more rapid abscission of the pedicels, but this was also altered by applications of IAA in lanolin. Again, the retarding effect of the applied IAA was proportional to the concentration applied. The removal of leaves resulted in a decreased number of flowers reaching anthesis. The application of IAA to the exposed nodes did not overcome this effect, which indicates that there is another factor(s) present in leaves which controls the maturation of flowers. [From author's summary. See also *H.A.*, 30: 5685.]—Iowa St. Univ., Iowa City.

2707. Ranjan, S., and Laloraya, M. M.
Metabolism of isolated leaves: I. Changes in the protein, soluble nitrogenous compounds, sugars, and organic acids in tobacco leaves in light and dark.
Plant Physiol., 1960, **35**: 714-25, bibl. 44.

Leaves of 2 varieties of tobacco were cultured in distilled water in the light and dark, and in streptomycin and penicillin solutions. It was found that, although the total amino-N content increases both in light and in darkness in detached leaves, the behaviour of individual amino acids is very variable. The S-20 variety failed to show any malic-citric conversion when cultured in water in the dark, whereas Cheroot showed typical malic-citric conversion but not when cultured in antibiotic solution. The culture of S-20 in antibiotic solution produced no change in the metabolism of organic acids. Feeding experiments showed the enzymes of the citric acid cycle to be operative in this variety. It is suggested that enzyme systems other than those of the Krebs cycle are found in certain varieties of tobacco, and that these are blocked in the presence of antibiotics. [From authors' summary.]—Univ. Allahabad, India.

2708. LaMotte, C. E., and Skoog, F.
Effects of tyrosine and related substances on organ formation in tobacco callus.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xix.

At 150 mg. per l. tyrosine strikingly stimulated bud formation in callus grown on a culture medium containing IAA and kinetin. Of 21 other amino acids tested 11 were significantly stimulatory, but none was as effective as tyrosine, and of 4 other phenylpropanoid compounds tested only *p*-hydroxyphenylpyruvic acid enhanced bud formation, though again to a lesser extent than tyrosine. Tyrosine reversed the inhibitory effects of IAA on bud formation and root development, and apparently also reversed the inhibitory effect of kinetin on root formation. Tyrosine induced both bud and root formation in the same callus tissues, when these were grown with intermediate levels of kinetin and IAA and high levels of inorganic N and P.—Univ. Wis., Madison.

2709. Il'in, G. S.
Studies on the chemistry of tobacco. [Russian.]
Tabak, 1960, **21**(4): 30-2, bibl. 19.

A concise review of world literature.

2710. Jarboe, C. H., and Quinn, A. D.
Low temperature column chromatography of tobacco acids.
Tobacco, N.Y., 1960, **151**(9): 31-5, bibl. 10.

Elution with butanol-chloroform mixtures at 0° C.

2711. Cundiff, R. H., and Markunas, P. C.
Modification of the extraction procedure for determination of alkaloids in tobacco.
J. Ass. off. agric. Chem., Wash., 1960, **43**: 519-24, bibl. 4.

As the original method introduced by these authors was unsatisfactory for tobaccos with high secondary amine contents, it has been improved by increasing the ratio of chloroform to benzene in the extractant, by using sodium in place of barium hydroxide as alkali and by adding glacial acetic acid to permit visual titration.

2712. Ogg, C. L., and others.
Determination of secondary, tertiary, and total alkaloids in tobacco.
J. Ass. off. agric. Chem., Wash., 1960, **43**: 524-9, bibl. 5.

An appreciation of the modified Cundiff-Markunas method [see previous abstract and also *H.A.*, 30: 847].

2713. Sadler, W. W., Chesson, R. R., and Schoenbaum, A. W.
Automated procedure for determining the nicotine content of steam distillates.
Tobacco, N.Y., 1960, **151**(19): 23-8, bibl. 9, illus.

Colorimetrically, based on the nicotine, cyanogen bromide and aniline reaction.

2714. Nebot Rodón, R.
Contribución al estudio de la formación de nicotina en la *Nicotiana rustica* L. **(The formation of nicotine in *Nicotiana rustica*.)** [English summary ¼ p.]
Farmacognosia, 1960, **20**: 105-203, 215-85, bibl. 87, illus.

The experimental plants were grown in sand culture and irrigated with nutrient solutions, one complete, the others each lacking one of the elements N, P, K, S, Ca or Mg. Analyses were carried out for total N and for the N present as protein, amino compounds, amides, nitrates and nicotine, in the roots and tops of plants at different stages of growth. The results showed that nicotine formation was more complex than mere degradation of protein or synthesis from nitrates.

2715. Griffith, G. D., Griffith, T., and Byerrum, R. U.
Nicotinic acid as a metabolite of nicotine in *Nicotiana rustica*.
J. biol. Chem., 1960, **235**: 3536-8, bibl. 11.

Nicotine-C^{14} was administered to *N. rustica* plants, and nicotine dipicrate and nicotinic acid hydrochloride were isolated after 4, 7 or 14 days. The nicotinic acid hydrochloride contained a significant quantity of isotope with dilution of specific activity ranging from 18 to 88. Approximately 60 to 80% of the total radioactivity fed to the plants was recoverable as nicotine dipicrate in all experiments. [Authors' summary.]—Mich. St. Univ., E. Lansing.

2716. Dawson, R. F., and others.
The biosynthesis of nicotine from nicotinic acid: chemical and radiochemical yields.
Arch. Biochem. Biophys., 1960, **91**: 144-50, bibl. 13.

Chemical and radiochemical yields for the biosynthesis of nicotine from nicotinic acid-2-H^3 as precursor were investigated. Chemical yield was unaffected by additions to the experimental system of precursors of either the pyridine or the pyrrolidine rings. This effect did not result from rapid reduction of precursor concentration to rate-limiting levels by competing reactions. Radiochemical yields increased over a period of 30 days following single-batch addition of the labelled precursor. [From authors' summary.]—Columbia Univ. and Brookhaven nat. Lab., N.Y.

2717. Kisaki, T., and Tamaki, E.
The phytochemistry of the tobacco alkaloids. II. Isolation of *d*-form predominant nornicotine from the roots of *Nicotiana tabacum* L.
Naturwissenschaften, 1960, **47**: 540-1, bibl. 3.

The authors succeeded in isolating nornicotine from among the alkaloids extracted from tobacco roots. However, the nornicotine was not the optically pure *l*-form but a *d*, *l*-mixture, in which the *d*-form predominated. This result is considered to cast doubt on the hypothesis that nornicotine is a direct precursor of nicotine, unless it can be shown that a mechanism exists whereby *d*, *l*-nornicotine with the *d*-form predominating can give rise to optically pure *l*-nicotine in tobacco plants.—Japan Monop. Corp., Yutaka-machi, Shinagawa-ku, Tokyo.

2718. Weybrew, J. A., Mann, T. J., and Moore, E. L.
Nicotine conversion and cherry-redness.
Tobacco, N.Y., 1960, **151**(15): 23-7, bibl. 7.

The absence of cherry-redness in the progeny of a segregating cherry-red family, Strain 7370, appeared to be due to their inability to demethylate nicotine.—N.C. St. Coll., Raleigh.

2719. Chan, T.-T., and Bird, I. F.
Starch dissolution in tobacco leaves in the light.
J. exp. Bot., 1960, **11**: 335-40, bibl. 2.

The changes in sugar and starch contents and the translocation of these substances from single attached leaves was investigated in light of various intensities after a short period of assimilation in $^{14}CO_2$. In all circumstances single attached leaves, depleted of starch, were allowed to assimilate a fixed amount of $^{14}CO_2$. About 50% of the ^{14}C assimilated was translocated from the lamina concurrently with assimilation. Of that remaining in the lamina 80% was incorporated into starch and sugar. Plants were then placed in air and continuous light of different intensities as a means of controlling further starch synthesis. At about 500 f.c. there was no change in amount of starch after 72 hours, but half the radioactivity was lost. At light intensities lower than 500 f.c. the percentage activity lost was greater than the percentage amount lost. In sunlight, where new starch synthesis was very rapid, loss in activity from the radioactive portion was prevented. In all circumstances activity virtually disappeared from both hexose and sucrose. It is concluded that starch dissolution proceeded in light even when the amount was increasing. It is further suggested that the loss was mainly from outer layers of the starch grains which were replaced by newly synthesized material. Loss of sugar was by direct translocation rather than passage to starch, and complete replacement by new photosynthate occurred in 24 hours. [From authors' summary.]—Imp. Coll. Sci. Tech., London.

2720. Wolffgang, H., and Schneider, S.
Über die Abhängigkeit des Phosphataseaktivität der Blätter von *Nicotiana tabacum* L. var. Samsun von der Lichtintensität. **(Dependence of phosphatase activity in leaves of *N. tabacum* var. Samsun on light intensity.)**
Flora, 1959, **148**: 110-18, from *CORESTA Inf. Bull.*, 1960, No. 3, Abstr. 3987.

Phosphatase activity in leaves of *N. tabacum* var. Samsun is partially controlled by light intensity. Changes in phosphatase activity occur approximately 1 hour after changes in light intensity. There is no endogenous rhythm in phosphatase activity in tobacco; it increases slightly from leaf tip to leaf base, and it is slightly greater in young leaves than in old ones.

2721. Lott, H. V.
Über den Einfluss der kurzwelligen Strahlung auf die Biosynthese der pflanzlichen Polyphenole. **(The influence of ultra-violet light on the biosynthesis of plant polyphenols.)** [English summary 1 p.]
Planta, 1960, **55**: 480-95, bibl. 66.

A new method for the estimation of polyphenols in plant material is described. In tobacco ultra-violet light irradiation caused large increases in the chlorogenic acid content, viz., up to 79% in plants growing in the open and up to 550% in greenhouse plants. The rutin content was raised by 27% in outdoor plants and by 28·5% in greenhouse plants. By excluding wavelengths under 350 mμ the maximum contents in greenhouse tobacco fell to 287% above normal for chlorogenic acid and to 6% above normal for rutin. [From author's summary.]—Inst. allg. Bot., E.T.H. Zurich.

2722. ZUCKER, M., AND STINSON, H. T., JR.
The role of chlorogenic acid and plastid pigments in the browning of variegated tobacco leaves.
Tobacco, N.Y., 1960, **151**(24): 21-6, bibl. 12.

A direct correlation was found between the chlorogenic acid contents of the green and white areas of variegated leaves of Connecticut shade tobacco and the water and alkali soluble brown pigments obtained therefrom after curing. The green tissue also contained larger amounts of a polyphenol oxidase and protein; but the plastid pigments did not directly affect the browning reaction, although they must have an indirect effect through their role in photosynthesis.—Conn. agric. Exp. Stat., New Haven.

2723. SHAW, W. G. J., STEPHENS, R. L., AND WEYBREW, J. A.
Carbonyl constituents in the volatile oils from flue-cured tobacco.
Tobacco, N.Y., 1960, **151**(12): 19-23, bibl. 6, illus.

Separation and identification.

Disorders, diseases and pests.

(*See also* 1692, 1693, 1815, 1839, 2668, 2674, 2675, 2759, 3570, 3592.)

2724. STEINBERG, R. A.
A greenhouse survey of resistance to frenching in *Nicotiana* species.
Tobacco, N.Y., 1960, **151**(22): 27-31, bibl. 13.

Frenching capacity was produced in the soil by liming and adding excess dicalcium phosphate after steam sterilization. Nitrogen was kept to a minimum. Of the 57 species tested only *N. acaulis* and *N. thyrsiflora* failed to give a frenching response. Only moderate increases in resistance were exhibited by a few autopolyploids and interspecific hybrids. Extreme frenching responses were obtained from other solanaceous plants, such as tomato, eggplant, capsicum and petunia, but the leaves of *Cestrum nocturnum* remained normal.—U.S.D.A., Beltsville, Md.

2725. MATHRANI, D. I.
Diseases in flue-cured tobacco.
Indian Tobacco, 1960, **10**: 171-7, illus.

Control measures for damping-off, blackshank, anthracnose, frog-eye spot, brown spot, powdery mildew, tobacco mosaic, leaf curl, and infestations of broomrape and nematodes.

2726. VÖLK, J.
Beobachtungen zur Ausbreitung des Tabakrippenbräunestammes des Y-Virus in Freiland. **(Observations on the spread of the tobacco rib-browning strain of the Y virus in the field.)**
Zbl. Bakt., 1960, **113**: 687-99, bibl. 3.

Six years' observations relate crop infection to aphid incidence [see also *H.A.*, 30: 4008].

2727. MARCELLI, E.
A proposito di una variante necrotica del virus Y della patata. **(Note on a necrotic variant of the potato Y virus.)**
Tabacco, 1960, **64**: 158-71, bibl. 9, illus.

This variant has now appeared on tobacco in Italy, where all the varieties grown at present are susceptible. Resistant varieties are mentioned from the literature. Certain interspecific hybrids with *Nicotiana glauca* or *N. tomentosa* as the resistant parent have shown promising resistance.

2728. HOLMES, F. O.
Attainment of an improved level of resistance to infection by tobacco mosaic virus in tobacco.
From abstr. in *Phytopathology*, 1960, **50**: 572.

New breeding lines more resistant to TMV infection than any hitherto available.

2729. HIRAI, T., AND SHIMOMURA, T.
The mode of action of some antibiotics in their inhibitory effect on tobacco mosaic virus multiplication. [German summary 19 lines.]
Phytopath. Z., 1960, **40**: 35-44, bibl. 26.

Mitomycin C inhibited TMV production in tobacco leaf tissues most effectively at 25 p.p.m. Naramycin (cycloheximide) and its derivatives also inhibited TMV multiplication at fairly low concentrations.—Fac. Agric., Nagoya Univ., Japan.

2730. MICZYNSKI, K. A.
An attempt to inhibit the multiplication of tobacco mosaic virus in tissue culture by its antiserum.
Ann. appl. Biol., 1960, **48**: 739-41, bibl. 7.

Multiplication not affected by the antiserum.

2731. GOODCHILD, D.
The effect of light on the synthesis of tobacco mosaic virus.
Thesis summary in *J. Aust. Inst. agric. Sci.*, 1960, **26**: 283.

In *Nicotiana tabacum*, *N. glutinosa* and *Datura stramonium*.

2732. Lojdina, G. I.
Interrelations between respiration and tobacco mosaic virus (TMV) accumulation in isolated tobacco leaves. [Russian, with English summary 8 lines.]
Izv. Akad. Nauk SSSR, Ser. biol., 1960, No. 2, pp. 272-8, bibl. 14.

2733. Stokes, G. W.
Difference in the behavior of the *Nicotiana longiflora* wildfire resistance locus in tobacco varieties Burley 21 and Ky 61.
Phytopathology, 1960, **50**: 770-2, bibl. 6.

Burley 21 proved more resistant than Ky 61.

2734. Cole, J. S.
Field spray trials against wildfire and angular leaf spot of tobacco in Rhodesia.
Ann. appl. Biol., 1960, **48**: 291-8, bibl. 10.

When streptomycin-sensitive strains of *Pseudomonas tabaci* were used, streptomycin gave the best control. During one test strains of *P. tabaci* developed which were resistant to streptomycin: this was followed by a rapid breakdown of control. In another test, which compared streptomycin, oxytetracycline, neomycin, chlortetracycline and copper, streptomycin was the only effective spray. Cultures, isolated at the end of this test, showed resistance to all the antibiotics except chlortetracycline, but they lost their pathogenicity during laboratory tests. Oxytetracycline was generally no better than the lower rate of copper, and in one test it was ineffective. When variants resistant to streptomycin were used, a mixture containing oxytetracycline and streptomycin at quarter-strength and copper at half-strength was slightly better than full-strength copper or a mixture of half-strength copper and oxytetracycline. Half-strength streptomycin and copper was slightly better than full-strength copper or half-strength streptomycin and oxytetracycline against a mixture of streptomycin-resistant and sensitive variants of *P. tabaci*. [From author's abstract.]—Tobacco Res. Bd, Rhod. Nyasaland.

2735. Shaw, L., Lucas, G. B., and Wilson, J. H., Jr.
Further studies with streptomycin for wildfire control in burley tobacco plant beds, North Carolina, 1958.
Plant Dis. Reptr, 1959, **43**: 753-4, bibl. 4.

Excellent control of wildfire (*Pseudomonas tabaci*) on burley tobacco in the plant bed resulted from 4 weekly spray applications of either streptomycin sulphate or streptomycin nitrate at concentrations of 200 p.p.m. Either 2 or 3 spray applications of streptomycin sulphate at a concentration of 400 p.p.m., beginning 1 week after the plants were inoculated with *P. tabaci*, effectively arrested the disease and prevented losses in stand. Post-infection spray treatments with streptomycin sulphate appear to have considerable practical value in controlling wildfire in burley tobacco plant beds. However, it is evident from these tests that the use of Tween 20 and growth regulating substances in mixtures containing streptomycin sulphate had little value in wildfire control. [Authors' summary.]—U.S.DA., and N.C. St. Coll.

2736. Woeber, O., and Schipfer, L.
Der Mehltau des Tabakes. I. **(Powdery mildew of tobacco. I.)**
Tabakpfl. Österr., 1959, **10**(4): 9-11, from *CORESTA Inf. Bull.*, 1960, No. 2, Abstr. 3816.

The following fungicides are recommended: powdered sulphur scattered on the soil (100 kg./ha.); salicylic anilide; Karathane with a wetting agent (60–120 g./100 l.), which remains active for 2 to 3 weeks and does not affect the taste of the tobacco; and antibiotics (streptomycin and terramycin) in synergistic association with tribasic copper sulphate (50 g. of mixture/100 l.) in repeated sprays.

2737. Pont, W.
Blue mould (*Peronospora tabacina* Adam) of tobacco in North Queensland: some aspects of chemical control.
Qd J. agric. Sci., 1959, **16**: 299-327, bibl. 20, illus.

Results of field trials showed that mixtures of copper or organic fungicides with cottonseed oil, white oil, cottonseed oil plus malachite green, white oil plus malachite green, cottonseed oil plus benzyl salicylate or cottonseed oil plus methyl salicylate were more effective than standard fungicides. Evidence is given suggesting that tobacco plants which have been exposed to blue mould infection acquire a resistance to subsequent re-infection.

2738. Anon.
Grave epidemie causée en Europe par le *Peronospora tabacina* Adam. **(A serious epidemic of *Peronospora tabacina* in Europe.)**
Rev. int. Tabacs, 1960, **35**: 171-5.

Sanitary measures in the field are recommended to contain the disease, and dusting with zineb, ferbam or maneb to control the fungus.

2739. Berger, P.
Über das Auftreten von *Peronospora tabacina* Adam in einigen Tabakbeständen der Deutschen Demokratischen Republik. **(The appearance of *Peronospora tabacina* in some tobacco growing areas of East Germany.)** [Russian and English summaries 6 and 5 lines.]
Ber. Inst. Tabakforsch. Dresden, 1960, **7**: 70-80, bibl. 13, illus.

A literature review, covering blue mould attack and the possibilities for preventive and curative control.

2740. Zanardi, D.

La muffa blu del tabacco. Storia, biologia, danni e difese. (**Blue mould of tobacco. History, biology, damage and protection.**)

Ital. agric., 1960, **97**: 1075-86, bibl. 28, illus.

A review, with emphasis on the control of *Peronospora tabacina* by dusting with zineb in an inert carrier (20% in tobacco powder, or 10% in pyrophyllite) or by spraying with streptomycin.

2741. Corbaz, R.

Le mildiou du tabac en Suisse. Résultats des premiers essais de lutte. (**Blue mould of tobacco in Switzerland. Results of the first experiments on control.**)

Rev. romande Agric. Vitic., 1960, **16**: 101-4, bibl. 1, illus.

In 1960 *Peronospora tabacina* became wide-spread in the tobacco fields of Switzerland. Glasshouse experiments showed that ornamental tobacco species are also susceptible to the fungus but confirmed that *Nicotiana debneyi* is resistant. The susceptibility of two *Physalis* spp. was confined to the cotyledon stage. In control experiments, also under glass, zineb gave the best results of 13 chemicals tested, both as a spray (0·4%) and as a dust (7·5% active agent). Maneb proved phytotoxic unless used as a spray at only 0·2–0·3%. Bulbosan dust was an effective fungicide, but its influence on the plants and on the quality of tobacco remains to be determined.—Stats féd. d'Essais agric., Lausanne (Domaine de Changins-sur-Nyon).

2742. Morgan, O. D.

The use of chemical soil drenches to control *Phytophthora parasitica* var. *nicotianae* and their phytotoxic effects on tobacco and toxicity to other soil flora.

Plant Dis. Reptr, 1959, **43**: 755-61, bibl. 13.

Effective control (95–100%) of *Phytophthora parasitica* var. *nicotianae* was obtained with 7 chemicals applied as drenches. Omadine derivatives (disulphide, Zn, Fe and Mn) controlled the fungus at 300 and 600 p.p.m., N521 (Mylone) at 300 and 400 p.p.m., Chemical 5,400 at 600 p.p.m., and Orthocide 406 at 300 p.p.m. The pH of some of the soils was increased by the treatments. Plants in Orthocide- and chloropicrin-treated soils were taller, but had smaller leaves, than control plants. All the other chemicals caused stunting when tobacco was planted 4 days after treatment, but with an interval of 3 weeks before planting the tobacco grew normally. Orthocide and chloropicrin treatments were followed by a significant increase in bacterial flora in the soil, but the effects of other treatments were less marked; fungus populations after treatment were significantly lower than those of the untreated controls. N521 was considered the most promising of the materials tested for *Phytophthora* control. [See also *H.A.*, 30: 880.]—Univ. Md agric. Exp. Stat., College Park.

2743. Smith, W. A., and Saunders, G. W.

Tobacco pests controlled in seedbed and field.

Qd agric. J., 1960, **86**: 423-4.

Recommended measures for insects, mites and nematodes.

2744. Brénière, J.

Note sur *Gonocephalum simplex* Fabr. coléoptère ténébrionide nuisible au tabac de Madagascar. (**A note on *Gonocephalum simplex*, a tenebrionid attacking tobacco in Madagascar.**) [English and Spanish summaries ½ p. each.]

Agron. trop., Paris, 1960, **15**: 414-33, bibl. 10, illus.

The damage caused, and the morphology and biology of the insect are described. As a control measure aldrin, dieldrin or endrin may be applied, at 0·05 g. of active material, to the base of each plant. BHC had an adverse effect on the tobacco. [For earlier work, see *H.A.*, 31: 917.]

2745. Joshi, B. G., and Kurup, A. R.

Laboratory studies in the relative stomach toxicity of certain chlorinated hydrocarbon insecticides to the tobacco cutworm.

Indian Tobacco, 1960, **10**: 165-7, bibl. 8.

The relative toxicities to *Prodenia litura* of various chemicals tested were DDT 1·0, Rhothane 2·4, endrin 13·2, aldrin 16·6 and dieldrin 26·5.—Cent. Tob. Res. Inst., Rajahmundry.

2746. Kincaid, R. R., and others.

Effect on shade grown tobacco of certain insecticide residues in the soil.

Tobacco, N.Y., 1960, **151**(18): 173-80, bibl. 9.

DDT, TDE, lindane and endrin were incorporated into the soil at rates of 15 to 75 lb./acre. Lindane at 75 lb. significantly decreased the yield of cigar-wrapper tobacco in the first season after treatment; all other treatments increased yield, but not significantly, during the 3 seasons. Endrin at 75 lb. increased grade index significantly in the first season. Lindane at 75 lb. injured roots, reduced plant height and delayed blooming of tobacco during the first season. One or more rates of each insecticide significantly reduced cutworm damage during the second season. All treatments reduced the root-knot index, in some instances significantly, during the third season; lindane at 75 lb. reduced the coarse-root index significantly. Soil samples were analysed for organic chlorine, calculated in terms of the insecticide applied. In all cases the major portion disappeared during the test period of 5⅔ years. Disappearance of each insecticide during the course of any one year was as follows: DDT, 18%; TDE, 20%; lindane, 24%; and endrin, 11%. [From authors' summary.]—N. Fla Exp. Stat., Quincy.

Harvesting and processing.

(*See also* 2654.)

2747. Michael, S.
Seasonal operations in the production of yellow leaf tobacco.
Countryman, Nicosia, July-August, 1960, pp. 14-15, illus.

Advice on harvesting and sun curing.

2748. Anon.
Ingenious "Tilita" clip cuts leaf harvest costs.
Tobacco, N.Y., 1960, **151**(20): 11, illus.

Designed to prime and fix tobacco in one operation, ready for hanging without strings, the clip, developed in Rhodesia, consists of flat coil springs mounted on a light wire frame, the leaves being inserted between the coils. Each normal tobacco stick carries 2 clips held by four hooks. A picking speed of 90 leaves per man per minute is readily attainable with a good operator.

2749. Tomarovskij, P. F., Brikel', A. Ja., and Gordienko, A. L.
Harvesting and curing tobacco by the stalk-cutting method. [Russian.]
Tabak, 1960, **21**(4): 34-6.

In experiments at Alma-Ata the lowest 5–6 leaves of a cigarette tobacco were picked at the right stage of maturity, and the whole plants were then cut 2–3 weeks after topping. The plants were hung in a barn where the leaves dried in 20–25 days. By comparison with the harvesting of individual leaves the stalk-cutting method gave slightly higher yields, improved leaf colour and quality and had lower labour requirements.

2750. Sastry, A. S., and Rao, B. V. K.
Water culture improves grades of top leaves in flue-cured tobacco. (Studies on a commercial scale.)
Indian Tobacco, 1960, **10**: 159-61, bibl. 3.

These studies showed that the "total bright leaf equivalent" of top leaves could be increased by over 40% by standing their bases in water for 4 hours before curing. [For earlier work, see *H.A.*, 29: 1593.]

2751. Berberan, J. C.
Estufas para cura de tabaco. (**Barns for flue-curing tobacco.)**
Rev. agron., Lisboa, 1960, **43**: 1-33, bibl. 8, illus.

General principles of construction and operation, and a description of a model recommended originally by the Tobacco Research Board of Rhodesia and Nyasaland [see *H.A.*, 26:1880].

2752. Johnson, W. H., and others.
Bulk curing of bright leaf tobacco. A curing operation compatible with mechanization.
Agric. Engng, St. Joseph, Mich., 1960, **41**: 511-15, 517, bibl. 7, illus.

See *H.A.*, 30: 5718.

2753. Weidemann, C.
Erfahrungen mit der Tabaktrocknung im Jalousiehang. (**Experience with tobacco curing by the jalousie method.)** [Russian and English summaries ⅓ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1960, **7**: 57-69, bibl. 6, illus.

The construction and use of a curing barn is described, in which the tobacco leaves are suspended on racks resembling jalousies. The leaves hang between 2 strings, which are kept apart by laths spaced at certain intervals, and as the rack is filled it is gradually raised into the roof of the barn by means of a winch and pulley system. Curing took only one day longer when frames were spaced at 15 cm. as compared with 30 cm. Curing by the jalousie method needed less labour and simplified operations by comparison with the conventional frame curing method. More tobacco can also be dried in the same volume of barn space.

2754. Dimitrov, L. S.
The physical properties of heating in tobacco curing. [Bulgarian.]
Nauč. Trud. Sofia, 1959, **2**: 212-28, bibl. 11, from *Abstr. Card Inst. Tabakforsch. Dresden*, No. 60/448.

An investigation led to the following conclusions: There was no constant drying speed of strung tobacco leaves in the temperature range between 40° and 70° C. Factors producing swift air exchange between the drying leaves and the outer air affected the rate of moisture loss. An increase of 10° C. in the temperature resulted in a 2½-fold increase in the rate of water loss. A reduction in the relative humidity had little effect on the rate of water loss.

2755. Murty, G. S., and Singh, M.
Curing of cigar wrapper tobacco.
Indian Tobacco, 1960, **10**: 153-8, bibl. 5.

Methods of supplying artificial heating and humidity control discussed.

2756. Asmaev, P. G., and Trubnikov, V. F.
The problem of humidification of tobacco leaves. [Russian.]
Tabak, 1960, **21**(4): 27-9, bibl. 4.

During the humidification of tobacco in conditioned air the distribution of moisture in the different parts of the leaf blade was not uniform. The unevenness of the moisture content increased with rising R.H. A sharp increase in this unevenness above 50% R.H. was due apparently to the beginning of active absorption of moisture by the crystalloid complex, which itself is unevenly distributed in the tobacco leaf.

2757. Borodjanskij, V. P.
Fixation of standard bales after completion of pressing. [Russian.]
Tabak, 1960, **21**(4): 26-7.

Bales of tobacco of 14% moisture content held in clamps for 24 hours increased in height, after release, by 7%, whereas bales not subjected to fixation after pressing increased in height by 44%.

2758. Pienaar, E. W.
Grading Turkish tobacco.
Fmg S. Afr., 1960, **36**(8): 40-2, illus.

The farmer is paid according to the tonga system of grading, in which 30 to 40 crops of the same picking are mixed and each picking is divided into 12 intake grades. Later the leaves are divided into 9 warehouse grades, which in turn are blended into 5 selling grades.—Cent. Tob. Res. Stat., Rustenburg.

2759. Martelli, G. M.
Misfatti del tarlo del tabacco. (**Damage caused by the cigarette beetle [*Lasioderma serricorne*].)**
Ital. agric., 1960, **97**: 1231-5, illus.

Including notes on control by fumigation and X-ray treatment of stored tobacco and by light traps to capture the adults.

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS.

Condiment and spice plants.

(*See also* 2802, 3223, 3560, 3576, 3598, 3608.)

2760. Maleeny, R. T.
Longer storage life for spices.
Food Processing, 1960, **21**(6): 44-5, illus., from *Trop. Abstr.*, 1960, **15**, Abstr. 2376.

In a new process the essential oils and/or oleoresins of spices are blended with a dry base, dispersed into a colloidal solution of edible gum and spray-dried. The resultant protective coating prevents oils from evaporating and from having access to oxygen. The encapsulated spices retain their flavour longer and have greater flavour stability than dry solubles or crude spices. Results are given of flavour stability and organoleptic evaluation tests on ginger, celery, black pepper and nutmegs.

2761. Bhowmick, T. P., and Chattopadhyay, S. B.
Germination of seeds of larger cardamom.
Sci. and Cult., 1960, **26**: 185-6.

It is suggested that raising *Amomum subulatum* from seed would provide a means of controlling the virus disease known as *foorki*. Seeds were found to remain dormant for a period of 7–8 months. Dormancy is broken in May and germination reaches a peak in mid-June. Germination, which is uneven, is hypogeal and maximal between 62° and 87° F.—State agric. Res. Inst., Calcutta-40.

2762. Bhagwat, V. Y.
Control of soft rot of ginger.
Poona agric. Coll. Mag., 1960, **51**: 47-9.

Bordeaux 2 : 2 : 50 reduced the post-emergence mortality of sets caused by *Pythium myriobylum* and increased yields very considerably. Cheshunt compound did not reduce the mortality but gave some increase in yield.

2763. Thornberry, H. H.
A control for decline of horseradish clones.
Ill. Res., 1960, **2**(3): 17-18.

Decline, probably caused by a virus, can be controlled if only vigorous clones are propagated.

2764. Moschini, E.
La coltivazione del prezzemolo (*Petroselinum hortense* Hoffm.). (**The cultivation of parsley.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 143-53, illus.

The subjects discussed are varieties (4 of *P. hortense foliosum* and 2 of *P. hortense tuberosum*), chemical composition, soils, sowing, fertilization, cultivation in orchards or with other vegetables, cultural practices including spacing and harvesting, diseases and pests, yields (averaging 200 quintals per ha. but reaching 400 q. in the Riccia and Gigante varieties).

2765. U.S. Department of Agriculture, Foreign Agricultural Service.
Record postwar pepper crop forecast for 1960.
Foreign Agric. Circ. U.S. Dep. Agric. **FTEA 2-60**, 1960, pp. 14.

At 191·2 m. lb. compared with pre-war average of 184·2 m. lb.

2766. Sills, V. E.
Rural industries. 4. Pepper.
Agric. J. Dep. Agric. Fiji, 1960, **30**: 61-5, bibl. 7, illus.

Advice on the cultivation of a crop recently introduced from Sarawak.

2767. de Waard, P. W. F., and Sutton, C. D.
Toxicity of aluminium to black pepper (*Piper nigrum* L.) in Sarawak.
Nature, 1960, **188**: 1129-30, illus.

The symptoms of Al toxicity were an overall yellow-green colour, drooping leaves and a speckled necrosis leading to leaf fall. The root system was also reduced. This has occurred where the traditional burnt earth, used as a manure, has been replaced by artificials which have lowered the pH of the soil. Very low pH has caused Al toxicity leading to reduced Ca and Mg uptake and a high K/Ca + Mg ratio in the leaf. Dressings of magnesium limestone appear to prevent this toxicity.

2768. Thomason, I. J., Van Gundy, S. D., and McKinney, H. E.
Thermotherapy for root-knot nematodes, *Meloidogyne* spp., of sweet potato and tarragon propagating stocks.
Plant Dis. Reptr, 1960, **44**: 354-8, bibl. 4.

Hot water treatment of tarragon (*Artemisia dracunculus*) rhizomes at 113° F. for 25 minutes gave only partial nematode control and destroyed about one-third of the rhizomes.—Univ. Calif., Riverside.

2769. Patnaik, S., Patra, B. C., and Mohapatra, K. C.
Flowering behaviour and anthesis of *Curcuma longa* L.
Curr. Sci., 1960, **29**: 402, illus.

Drug plants.

(*See also* 2510, 2731, 3219, 3541.)

2770. Masiluñgan, V. A., Diokno, N. C., and Quisumbing, V. B.
Screening of Philippine medicinal plants used in the treatment of tuberculosis for substances inhibitory to *Mycobacterium tuberculosis* 607.
Philipp. J. Sci., 1960, **88**: 245-51, bibl. 8.

Of 45 plants tested 38 were found to have antimycobacterial properties. The activity was most marked in *Acacia farnesiana*, *Bambusa spinosa*, *Zingiber officinale* and *Tectona grandis*.

2771. Madan, B. R., Arora, R. B., and Kapila, K.
Anticonvulsant, antiveratrinic and antiarrhythmic action of *Acorus calamus* Linn.—an Indian indigenous drug.
Arch. int. Pharmacodyn, 1960, **124**: 201-11, illus., from *Biol. Abstr.*, *Sect. D*, 1960, **35**, Abstr. 54,217.

The dried rhizome yielded 1·5% of a neutral, yellow, aromatic, essential oil, with medicinal effects resembling those of quinidine.—All India Inst. med. Sci., New Delhi.

2772. Soine, T. O., and Willette, R. E.
The isolation of β-allocryptopine from *Argemone squarrosa* subsp. *squarrosa*.
J. Amer. pharm. Ass., *sci. Ed.*, 1960, **49**: 368-70, bibl. 11.

Contains approximately 1% of the alkaloid.

2773. Kinoshita, K.
Studies on the effects of manurial elements upon the growth and the yield of kuramuyomogi (*Artemisia kurramensis* Qazilbash.).
[Japanese, with English summary.]
Bull. nat. Hyg. Lab., 1958, **76**: 155-8, from *Biol. Abstr.*, *Sect. D*, 1960, **35**, Abstr. 57,117.

The best growth was obtained when NPK fertilizer was used; with NK or NP growth was slightly inferior. Manurial treatment had no effect on the santonin content.

2774. Schermeister, L. J., Crane, F. A., and Voigt, R. F.
Growth and differentiation of *Atropa belladonna* L. as affected by different sources of nitrogen.
J. Amer. pharm. Ass., *sci. Ed.*, 1960, **49**: 694-7, bibl. 8, illus.

Belladonna plants were grown from seed in water cultures containing 6 levels of nitrate-N and 3 of combinations of ammonium- and nitrate-N. By most of the criteria observed, growth of the plants was better with $NH_4 + NO_3$ than with NO_3 alone. On the basis of dry weight produced, the most satisfactory growth was obtained from NO_3 at 20 mg. equiv./l. and from $NH_4 + NO_3$ at 30 mg. equiv./l. High levels of NO_3 tended to raise the tissue water level, producing a more succulent plant than one supplied with $NH_3 + NO_3$. Because of this variation the dry weight was a more reliable criterion than the fresh weight for assessing growth changes. The root system was unusually large under low levels of nitrogen. [From authors' summary.]—Univ. Ill., Coll. Pharm., Chicago 12.

2775. Schermeister, L. J., Crane, F. A., and Voigt, R. F.
Nitrogenous constituents of *Atropa belladonna* L. grown on different sources of externally supplied nitrogen.
J. Amer. pharm. Ass., *sci. Ed.*, 1960, **49**: 698-705, bibl. 12.

Nitrates, nitrites, ammonia, amides, amino acids, proteins and alkaloids were determined in plants under all the treatments previously described [see preceding abstract]. At low N supply belladonna synthesized alkaloids preferentially over protein. At high levels more protein and soluble nitrogenous compounds accumulated in the tissue, while the alkaloid level was relatively low. There appeared to be no direct relation between alkaloid and protein. γ-Aminobutyric acid may be a precursor to the belladonna alkaloids. [From authors' abstract. See also *H.A.*, 29: 632.]—Univ. Ill., Coll. Pharm., Chicago 12.

2776. Catch, J. R., and Evans, E. A.
Rate of formation of atropine in *Atropa belladonna* plants.
Nature, 1960, **188**: 758-9, bibl. 7.

Two- to three-month-old plants were allowed to assimilate a single dose of $C^{14}O_2$ by photosynthesis, and sample plants were killed and extracted at intervals up to 31 days. The results, here presented, show a pronounced maximum of atropine activity at 20–25 days and a less pronounced maximum at 2–10 days, whereas total soluble activity reached a maximum within a few hours and then slowly fell off. These results suggest that atropine biogenesis is both a build-up from small molecules and a breakdown of large molecules, but with the latter process playing the greater part.—Radiochem. Centre, Amersham.

2777. Dunham, N. W., and Allard, K. R.
A preliminary pharmacologic investigation of the roots of *Bixa orellana*.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 218-19, bibl. 5.

An extract depressed voluntary activity in the mouse without impairing involuntary activity.

2778. Leete, E., and Nemeth, P. E.
The biogenesis of the alkaloids of *Colchicum*. I. The incorporation of phenylalanine into colchicine.
J. Amer. chem. Soc., 1960, **82**: 6055-7, bibl. 18.

The administration of DL-phenylalanine-3-C^{14} to sprouting *C. byzantinum* corms led to the formation of radioactive colchicine.

2779. Markiewicz, L.
Wpływ kwasu giberelowego na wzrost i rozwój niektórych gatunków róślin leczniczych. **(The influence of gibberellic acid on growth and development in some species of medicinal plants.)** [Russian and English summaries.]
Diss. Pharm., 1959, **11**: 343-53, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 42,472.

Experiments carried out under normal conditions of lighting showed that with doses of 300 μg. GA some of the 10 species tested reacted by intensified growth, attaining a size 2 or even 3 times greater than that of the control plants. No changes tending towards a shortening of the period of vegetative growth were observed either in annuals or biennials. *Digitalis purpurea* and *D. lanata* remained in the form of rosettes with elongated leaf stalks. Additional manuring plus the application of GA increased root size in *Vinca rosea* and stalk length in *Corchorus hirtus*.—Cracow pharm. Lab., Polish Acad. Sci.

2780. Weiss, F., and Manus, O.
The saponins of the leaves and seeds of *Digitalis purpurea* L.
Pharm. Zbl. Dtsch., 1959, **98**: 437-43, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 60,997.

A method for the isolation of saponins is described. Dry leaves contained about 1% of saponins, of which the chief aglycons were gitogenine and tigogenine. In the seeds digitogenine predominated. The sugars found were glucose, galactose and xylose.

2781. Preston, W. H., Jr., and Haun, J. R.
Some physiological and morphological aspects of growth and propagation of *Dioscorea spiculiflora*.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xxx.

The rooting of leaf-bud cuttings was not improved by the use of IBA, NAA or 2,4,5-TP, and GA prevented rooting. When the small rosetted shoots which develop from leaf-bud cuttings were grown under mist propagation, axillary buds taken from them formed new plants sooner and more easily than did leaf-bud cuttings taken from mature plants.—U.S.D.A., Glenn Dale, Md.

2782. Zaveruha, B. V., and Šimanskaja, V. O.
A rare medicinal plant. [Russian.]
Priroda, 1960, **49**(11): 109-10, illus.

Euphorbia volhynica, growing in the Ternopolsk region, is used in folk medicine.

2783. Zderkiewicz, T.
Wpływ nawózenia mineralnego na zawartość alkaloidów w *Hyoscyamus niger* L. **(The influence of mineral fertilizers on the alkaloid content of *Hyoscyamus niger*.)**
Ann. Univ. Mariae Curie-Skłodowska, Sect. D, 1958, **13**(7): 69-78, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 64,433.

Best results were obtained with an N,P,K,Ca combination, with which the alkaloid content reached 0·06%.

2784. Gaind, K. N., and Baveja, S. K.
Investigation of *Machilus macrantha* Nees. I. Pharmacognostical and phytochemical study of root. II. Pharmacological action and chemical constitution of machiline.
J. Amer. pharm. Soc., sci. Ed., 1960, **49**: 659-62, bibl. 9, and 663-5, bibl. 8.

The anatomy of the root is described, together with a technique for isolating the machiline as hydrochloride. The extract contained 5 alkaloids; it has hypotensive but no antibacterial activity.—Punjab Univ., Chandigarh.

2785. Pachter, I. J., and Hopkinson, A. F.
Note on the alkaloids of *Mefhysticodendron amesianum*.
J. Amer. pharm. Soc., sci. Ed., 1960, **49**: 621-2, bibl. 2.

Four alkaloids were extracted, of which *l*-scopolamine constituted over 80%; atropine was also present.

2786. Khastgir, H. N., Sengupta, S. K., and Sengupta, P.
Note on the constituents of the Indian medicinal plant *Oldenlandia corymbosa* Linn.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 562-3, bibl. 6.

γ-Sitosterol, triterpene acids, oleanolic acid and ursolic acid present, but no alkaloids.

2787. KINOSHITA, K.
Studies on the effects of nitrogenous manures upon the growth and the yield of opium poppy (*Papaver somniferum* L.). [Japanese, with English summary.]
Bull. nat. Hyg. Lab., 1958, **76**: 133-7, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 57,116.

The fresh weight of the plant and the opium, morphine and seed yields were highest with non-sulphatic fertilizers, such as ammonium chloride. Basic fertilizers, e.g. Chilean nitrate, gave slightly poorer growth. Neutral fertilizers, such as ammonium nitrate, and acidic fertilizers, such as ammonium sulphate, produced inferior growth. Manuring did not influence the morphine content.

2788. KINOSHITA, K., NAKAGAWA, Y., AND ISAKA, H.
Studies on the effects of the ratio of nitrogenous manures upon the growth and the yield of opium poppy (*Papaver somniferum* L.). [Japanese, with English summary.]
Bull. nat. Hyg. Lab., 1959, **77**: 267-71, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 57,118.

The whole plant fresh weight and the opium, morphine and seed yields were highest with 2 : 1 : 1 NPK fertilization. Whereas other yield components were reduced by increasing or decreasing the proportion of N, the morphine yield was not.

2789. STERMITZ, F. R., AND RAPOPORT, H.
O-Demethylation as a biosynthetic pattern in the formation of opium alkaloids.
Nature, 1961, **189**: 310-11, bibl. 2.

By root-feeding groups of opium poppy plants with labelled morphine, codeine and thebaine, respectively, and recovering the alkaloids later, evidence was obtained of the conversion of thebaine to codeine and of codeine to morphine with O-demethylation as a metabolic pathway.—Univ. Calif., Berkeley.

2790. PARIS, R., AND LETOUZEY, R.
Répartition des alcaloïdes dans le yohimbe (*Pausinystalia yohimbe*) (K. Schum) ex Pierre (Rubiacées). **(The distribution of alkaloids in the yohimbe (*Pausinystalia yohimbe*—Rubiaceae).)**
J. Agric. trop. Bot. appl., 1960, **7**: 256-8, bibl. 2.

The bark of the main roots, hitherto unexploited, is richer in alkaloids (with values of nearly 5%) than any other part of the tree, the principal substance being yohimbine. In the aerial parts the alkaloid content of the bark increases from soil level up to the first branches and decreases along the branches to low values in the twigs. The leaves contain little, if any, yohimbine, but contain certain indolic substances, which may be precursors of the alkaloid. [See also *H.A.*, 28: 600.]—Fac. Pharm., Paris.

2791. CAIN, J. C.
Miroestrol: an oestrogen from the plant *Pueraria mirifica*.
Nature, 1960, **188**: 774-7, bibl. 15.

The isolation and chemical and pharmaceutical properties of miroestrol are described. The plant has featured in folk medicine in Burma and Thailand, but it appears unlikely that the product in its present form will be of much medicinal use. —Nat. Res. Dev. Corp., London.

2792. KAWATANI, T., ISHIHARA, K., AND HEMMI, S.
On the trial cultivation of rauwolfias at Kasukabe, especially *R. serpentina* Benth. I. [Japanese, with English summary.]
Bull. nat. Hyg. Lab., 1958, **76**: 307-14, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 57,113.

The optimum temperature for seed germination of *R. serpentina* was 25° C. and the mean time necessary for germination 69 days. Plants germinating in June flowered in the open late in September, but those germinating later very rarely bloomed in the open. *R. caffra*, *R. canescens*, *R. verticillata* and *R. vomitoria* were more vigorous and easier to grow than *R. serpentina*.

2793. KAWATANI, T., ISHIHARA, K., AND HEMMI, S.
On the trial cultivation of rauwolfias at Kasukabe, especially *R. serpentina* Benth. II. [Japanese, with English summary.]
Bull. nat. Hyg. Lab., 1959, **77**: 243-57, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 57,114.

Seeds of *R. serpentina* and *R. canescens*, which failed to germinate in the same year as they were sown, overwintered in the open and germinated the following year. The optimum temperature for the rooting of *R. serpentina* cuttings was 22 to 25° C. Rooting was more successful with stem tip than with lower stem cuttings, success with the former being 60% and with the latter, 40%. The rooting of cuttings in the open was possible from May until August. Grafts between *R. serpentina* and the cold-resistant *R. verticillata* in both combinations rooted easily and grew well. Plants of *R. serpentina* required winter protection. Reserpine contents were highest in *R. serpentina* (0·0798–0·160%) and *R. vomitoria* (0·124%) and rescinnamine contents in *R. serpentina* (0·022–0·052%) and *R. canescens* (0·028%). The dry weight root yield of first year growth was higher in plants raised from seed than in plants raised from stem cuttings. However, no differences in the total alkaloids or the reserpine and rescinnamine contents were found between plants raised from seed and stem cuttings.

2794. Taki, M.
Experimental cultivation of *Rauwolfia serpentina* Benth. in Tane Island. I. On the experiment of germination.
Bull. nat. Hyg. Lab., 1958, **76**: 159-62, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 57,133.

When seeds were placed in salt water 59·1% of them sank. Seeds which did not sink rarely germinated. Percentage germination was only 16·5%.

2795. Miyazaki, Y., and Godaishi, K.
The germination of the seeds of rauwolfias, especially of *R. serpentina* Benth. I. With reference to the seeds from foreign sources.
Bull. nat. Hyg. Lab., 1959, **77**: 527-36, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 57,126.

Germination of seeds of *R. serpentina* was very irregular, beginning 20–30 days after sowing at temperatures of 20–30° C. The percentage germination of imported seeds was very low, ranging from 1·5 to 4·8%. Even in a glasshouse very few seeds germinated during the winter. Different media did not affect germination. Germination percentages for several other species are noted.

2796. Miyazaki, Y., and Godaishi, K.
Trial cultivation of rauwolfias, especially of *R. serpentina* Benth., at Isu in Japan. I. Results obtained in 1958. [Japanese, with English summary.]
Bull. nat. Hyg. Lab., 1959, **77**: 519-26, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 57,125.

The cold resistance and the effects of shading on top and root growth of several species were studied. In *R. serpentina* shading had very little effect and the plants were relatively cold resistant. *R. canescens* made more top growth than *R. serpentina* but was more sensitive to cold; when shaded both top and root growth were markedly reduced. Top growth of *R. verticillata* was relatively vigorous, and the plants were very cold resistant. *R. vomitoria* made vigorous top growth when unshaded but was much poorer when shaded and was very intolerant of cold. Sandy soil was most suitable for pot cultures of *R. serpentina*.

2797. Leete, E.
The biogenesis of the rauwolfia alkaloids. I. The incorporation of tryptophan into ajmaline.
J. Amer. chem. Soc., 1960, **82**: 6338-42, bibl. 26.

When DL-tryptophan-2-C^{14} was injected into the stems of intact *R. serpentina* plants there was a significant incorporation of tracer into ajmaline, reserpine and serpentine. Systematic degradation of the radioactive ajmaline established that tryptophan is a precursor of the reduced β-carboline moiety of this alkaloid. [From author's summary.]—Univ. Minnesota, Minneapolis.

2798. Kupchan, S. M., and Obasi, M. E.
A note on the occurrence of 2,6-dimethoxybenzoquinone in *Rauwolfia vomitoria*.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 257-8, bibl. 10.

The extraction of a non-alkaloidal constituent of an alkaloid-rich extract of *R. vomitoria* described.

2799. Chatterjee, A., and Ghosh, S.
Tinosporine, the furanoid bitter principle of *Tinospora cordifolia* Miers.
Sci. and Cult., 1960, **26**: 140-1, bibl. 4.

Partial elucidation of its chemical constitution.

2800. Gruenfeld, N.
The isolation and structure elucidation of *Veratrum* alkaloids.
Diss. Abstr., 1960, **21**: 467-8, being *L.C. Card No. Mic.* 60-3203 of 89 pp.

Three alkaloids from *Veratrum viride*.

2801. Farnsworth, N. R., and others.
Studies on *Vinca major* L. (Apocynaceae). I. Isolation of perivincine.
J. Amer. pharm. Soc., sci. Ed., 1960, **49**: 589-91, bibl. 14.

From leaves and stem; and properties of the alkaloid.

Essential oils.

(*See also* 2760, 2771, 2852.)

2802. Maruzzella, J. C., and Balter, J.
The action of essential oils on phytopathogenic fungi.
Plant Dis. Reptr, 1959, **43**: 1143-7, bibl. 13.

The *in vitro* activity of 119 essential oils was tested against 12 phytopathogenic fungi using the filter paper disk method. 84% of the oils were found to produce antifungal activity on at least 2 of the 12 test organisms. The greatest zones of inhibition were produced by oil of onion, garlic, thyme white, thyme red, origanum rectified (water white), origanum, bay, lemongrass, sweet birch (northern) and Bois de Rose. 80% of the essential oils were found to kill *Claviceps purpurea* (the most vulnerable organism), while 58% of the oils were active against *Alternaria tenuis* (the least susceptible organism). It is suggested that perhaps it may be practicable to use certain essential oils in plant disease control. [Authors' abstract.]—Long Is. Univ., Brooklyn, N.Y.

2803. Verma, S. M.
Carvone analysis by ultra-violet absorption in Indian dill oils (*Anethum sowa*).
Curr. Sci., 1960, **29**: 345-6, bibl. 5.

Carvone contents estimated by the absorbance of methanol solutions of dill oil at 320 mμ agreed closely with those obtained by titration with hydroxylamine hydrochloride.—Banaras Hindu Univ.

2804. Gottlieb, O. R., and Taveira Magalhães, M.
O óleo essencial da madeira da *Aniba firmula* Mez. **(The essential oil of the wood of *Aniba firmula*.)**
Bol. Inst. Quím. agríc., 1958, No. 54, pp. 15-20, bibl. 15, from *Trop. Abstr.*, 1960, **15**, Abstr. h3181.

Rosewood oil from forests near Rio de Janeiro contained benzyl benzoate and benzyl salicylate in nearly equal proportions and very little other constituent matter.

2805. Felklová, M.
Sledování obsahu silice v heřmánku římském *Anthemis nobilis* L. během vegetace. **(An investigation on the essential oil content of chamomile during the growing season.)** [Russian, German and English summaries ½ p. each.]
Rostlinná Výroba, 1960, **6**: 499-504, bibl. 7.

Data for fresh and dried material are presented. The highest values were found at the beginning of the flowering period.

2806. Watanabe, A.
On the cold resistance of *Cinnamomum camphora* Sieb. and *C. camphora* var. *nominale* Hay. from Formosa. [Japanese, with English summary.]
Bull. Tokyo Univ. Forests, 1958, **54**: 63-9, illus., from *Biol. Abstr.*, *Sect. D*, 1960, **35**, Abstr. 48,778.

Seasonal changes in the osmotic value and the water and carbohydrate contents of leaves of 1-year-old seedlings of *C. camphora* from Japan and from Formosa and of *C. camphora* var. *nominale* from Formosa were compared during winter. The seasonal trends of water relations and carbohydrate content agreed with those generally observed. The osmotic value and the soluble sugar content were highest throughout the season in *C. camphora* from Japan and lowest in *C. camphora* var. *nominale*, which was killed in early winter when the air temperature fell to —3° C. Water contents showed the reverse order.

2807. Oelker, G.
La coltivazione dei gelsomini. **(Jasmine growing.)**
Frutticoltura, 1960, **22**: 541-8, illus.

Descriptions are given of the 8 species of jasmine, and the superficially similar (but unrelated) *Trachelospermum jasminoides*, grown in Italy for their essential oils, with notes on propagation by cuttings, layering and grafting. The cultivation of *Jasminum grandiflorum* in Calabria, in association with bergamot orange, and the extraction of jasmine oil are also described. The composition of the oil is given.

2808. Baganz, H., and Teichert, P.
Contribution to the knowledge of the monoterpenes of the essential oil of juniper berries of Italian origin.
Arch. Pharm. Ber. dtsch. pharm. Ges., 1959, **292**: 442-9, from *Biol. Abstr.*, *Sect. D*, 1960, **35**, Abstr. 60,988.

α-Pinen, β-pinen, sabinen, myrcen, limonen and terpinolen were identified.

2809. Green, R. J., and Erickson, S. T.
Mint farming.
Agric. Inf. Bull. U.S. Dep. Agric. **212**, 1960, pp. 26, illus.

Mint producing areas, types of mint, culture, propagation and planting, weed control, diseases, pests, harvesting, distillation of oil and economics.

2810. Subramaniam, T. V.
The Japanese peppermint—*Mentha arvensis* L. Possibilities of cultivation in South India.
Madras agric. J., 1960, **47**: 153-8, bibl. 4.

Details of promising trials, with costings.

2811. Ikeda, N., and others.
Studies on the storage of mint seed. [Japanese, with English summary ½ p.]
Sci. Reps Fac. Agric. Okayama, 1960, No. 16, pp. 1–5, bibl. 6.

Mint seeds stored with a desiccating agent at a low temperature maintained their germinating capacity until the spring of the third year after harvest. Other methods tested were less satisfactory.

2812. Loomis, W. D., and Battaile, J.
Biosynthesis of terpenes in mint.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xv.

Experiments with $C^{14}O_2$ have shown that terpene synthesis in peppermint is a function of very young tissue only, but terpene interconversions occur in older tissue.—Oregon St. Coll., Corvallis.

2813. Dermelj, V.
Untersuchungen über *Sphaceloma menthae* Jenkins, der Erreger der Pfefferminzanthraknose. **(Investigations on *Sphaceloma menthae*, the causal agent of peppermint anthracnose.)** [English summary 1½ pp.]
Phytopath. Z., 1960, **40**: 151-86, bibl. 80, illus.

Experiment showed that saturation of the atmosphere for 48 hours and temperatures above 15° C. were necessary for infection of peppermint plants. At 20° C. the incubation period is 10 days, and at 16° C. 14 days. The fungus hibernates as mycelium in infected plant material and can also be carried over in *Mentha* spp. growing as weeds. Heavy infection reduced the menthol content of the leaves by half. In field trials Vitigran 1% (copper oxychloride) and ferbam 0·2% were the most effective fungicides, but even these did not give complete control.—Inst. PflSchutz. landw. Hochschule, Hohenheim.

2814. Berry, S. Z.
Determination of levels of *Verticillium* wilt resistance in mint.
From abstr. in *Phytopathology*, 1960, **50**: 569.
In increasing order the following 6 clones showed resistance: *Mentha piperita*, *M. spicata*, *M. piperita* × *M. crispa* hybrids 148, 161 and 185, and *M. crispa*.

2815. Chakravarti, R. N., Das, S. N., and Chakravarty, M. L.
Camphor from *Ocimum kilimandscharicum*.
Bull. Calcutta Sch. trop. Med., 1959, **7**: 103-5, from *Biol. Abstr.*, *Sect. D*, 1960, **35**, Abstr. 57,104.
In 5 samples the total volatile oil was 3·5–7·6% v./w. and the total ketones calculated as camphor were 2·113–4·33% w./w.

2816. Rabechault, H.
Note sur l'anatomie du *Pogostemon patchouli* Pel. et la localisation de ses essences. (**A note on the anatomy of *Pogostemon patchouli* and the localization of its natural oils.**) [English and Spanish summaries 8 lines each.]
Agron. trop., 1960, **15**: 568-75, bibl. 37, illus.
The secretory glands are described. Those situated on the leaf epidermis produce light, fluid oils, and those in the cortical tissues of the roots and stems secrete oils of much greater viscosity.

Fibres.

(*See also* 2871, 3596.)

2817. Heslop-Harrison, J.
Suppressive effects of 2-thiouracil on differentiation and flowering in *Cannabis sativa*.
Science, 1960, **132**: 1943-4, bibl. 4, illus.
The pyrimidine, 2-thiouracil, partly annuls the effect of photoperiodic induction in the short-day plant *C. sativa*, when it is supplied at the onset of the dark period in quantities of 15–30 μg. per plant. This treatment also produces aberrations in cellular differentiation in the leaves. Tracer studies show that 2-thiouracil becomes bound in cellular ribonucleic acid, which suggests that the effects on morphogenesis are due to interference with nucleic acid metabolism. [Author's abstract.]—Birmingham Univ.

2818. Herich, R.
Gibberellin and sex differentiation of flowering plants.
Nature, 1960, **188**: 599-600, bibl. 2.
Seeds of *Cannabis sativa* were soaked for 24 hours in solutions containing 5, 10, 25 and 100 p.p.m. of GA. An increased percentage of female individuals followed GA treatment, the highest increase being caused by the 10 p.p.m. concentration. When the average stem lengths were compared at the end of vegetative growth, the greatest response was shown by female plants treated at 5 p.p.m., the optimum for males being 10 p.p.m. The inhibiting effects of higher concentrations were most marked with the female plants.—Comenius Univ., Bratislava.

2819. Ram, M.
Occurrence of endosperm haustorium in *Cannabis sativa* L.
Ann. Bot., Lond., 1960, **24**: 79-82, bibl. 3, illus.
A histological study.

2820. Tanganyika Sisal Growers Association.
Annual Report of the Tanganyika Sisal Growers Association 1959-1960, 1960, pp. 74, illus.
Field experiments: In the bulbil nursery trial only limestone and sisal waste gave significant increases in plant weight. The most striking feature of the cultivation trial was the decline in yield in the 3rd and 4th cycles in the clean weeded treatments. The early cutting experiment demonstrated the drastic effect of over-cutting. In the manurial trials Ca, N, P and, to a lesser extent, K increased yields, but not so effectively as sisal waste. *Herbicides:* 2,4-D and MCPA have proved suitable for broad-leaved weeds, and CMU and dalapon for annual grasses and for pre-planting sprays in both nursery and field. *Plant physiology:* Symptoms produced by deficiencies of all the major and many minor nutrients have been evaluated. In a trace element toxicity trial Mn, Co and Ni produced toxicity symptoms, and Cu, Zn, Al and Cr reduced growth.

2821. Diekmahns, E. C.
Cultivations in sisal fields.
Bull. Kenya Sisal Bd, 1960, No. 34, pp. 19-20, illus., from *Trop. Abstr.*, 1961, **16**, Abstr. i161.
Accepting the fact that weed control is essential, a cultivation trial was started at Mlingano, Tanganyika. The initial first-cycle results showed that clean weeding treatment provided the highest fibre yields, but the yields fell appreciably in subsequent cycles. In a cover crop trial clean weeding is being compared with covers of grass (*Panicum trichocladum*) and 2 legumes (*Pueraria phaseoloides* and *Dolichos argenteus*). On the second-cycle land the clean weeding treatment has given the highest yield to date, but the tropical kudzu (*P. phaseoloides*) is the best of the other 3 treatments. A factorial manurial trial also provides a striking example of the value of a legume cover.

2822. SANDERS, M. B., AND FLEMING, S. D.
The use of herbicides to control grass and weeds in sisal lands.
Bull. Kenya Sisal Bd, 1959, No. 29, pp. 40-2.

Digitaria scalarum was completely controlled by the following programme: The land was ploughed in September-October and then disked in November-December and again in January. In March dalapon at 15 lb./acre in 120 gal. water was applied to the couch grass which was then 6–8 in. high. The area was lightly disked 5 weeks later and the sisal planted after another week's delay. Costs are detailed. In bulbil nurseries a similar interval of 6 weeks should be allowed between dalapon treatment and planting. "Soft weeds", which often become prolific after couch control with dalapon, can be controlled with MCPA or 2,4-D (amine); 2,4-D (ester) is toxic to young bulbils.—From *Weed Abstr.*, **9**, No. 1756.

2823. ANON.
Zacaton root.
Comerc. exterior México, 1960, **6**(8): 19-21, from *Trop. Abstr.*, 1960, **15**, Abstr. h2736.

A brief note on the production and export of fibre from *Epicampes macroura*, which is grown in Mexico between 1,800 and 2,400 m. altitude on deep forest soil.

Hops.

(*See also* 1839, 3582, 3592, 3610, 3611.)

2824. ANTIPOVIČ, D., AND BERÁNEK, F.
Sortiment odrůd chmele a jeho využití. **(A collection of hop varieties and its uses.)**
Chmelařství, 1960, **33**: 26-7, illus.

Between 1956 and 1959 60 Czechoslovak and foreign hop varieties were tested for date of maturity, resistance to downy mildew, quality, suitability for mechanical harvesting and yield. The Czechoslovak Osvald clones produced the highest yields and quality; hence the introduction into commercial growing of foreign varieties is not contemplated.

2825. HOP ADVISORY COMMITTEE, INSTITUTE OF BREWING.
Trials of Wye variety hops: FF.21, OF.27, OZ.97a.
J. Inst. Brew., 1960, **66**: 383-7.

FF.21 (Early Choice) and OF.27 were found suitable in the majority of brewing trials as 50% replacement in spring beers and as 25% replacement in autumn beers. OZ.97a was acceptable to some, but not all, brewers as 25% replacement in the spring and as 50% replacement in the autumn.

2826. ZAJÍČEK, E.
Mechanizace ve chmelnicích na jaře se zřetelem na novou velkovýrobní technologii. **(Mechanization in hop gardens in the spring with reference to the new technology for large scale production.)**
Chmelařství, 1960, **33**: 57, illus.

Notes on tractor-drawn implements for ploughing and cultivation [see also *H.A.*, 30: 4088].

2827. SKLÁDAL, V.
Řídí se řez chmele pevnou agrotechnickou lhůtou nebo počasím? **(Is the pruning of hops controlled by a firm cultural date or by the weather?)**
Chmelařství, 1960, **33**: 38-9.

In 1959, an early season, hops were pruned on 5 March, 21 March and 16 April. Bines on the plants pruned on the two earlier dates grew more vigorously and attained a greater final height than those on the late-pruned plants. It is suggested that hops should be pruned immediately conditions are favourable for bud burst, i.e. when the soil temperature at a depth of 15 to 20 cm. reaches 4 to 6° C.

2828. KLAPAL, I. M.
K otázce nejvhodnější doby jarního řezu chmele. **(The most suitable time for spring pruning hops.)**
Chmelařství, 1960, **33**: 55.

From 10 years' observations it is concluded that in years when the rainfall before the beginning of growth is sub-normal the best results are obtained when hops are pruned between 25 March and 8 April, whereas when the spring rainfall is normal or above-normal pruning is best deferred until between 6 and 19 April.

2829. THOMPSON, F. C.
A long-term manurial experiment with hops. The effect of heavy manuring on soil fertility and on the yield, leaf mineral content and resin content of the variety Fuggle.
J. hort. Sci., 1960, **35**: 185-201, bibl. 11.

High N tended to depress yield. With high P and high K the yield response was large initially, but it decreased as the levels of soil-available P and K rose to the "very high" category, after which the response became very small or negative. Applied Mg increased soil-available Mg significantly but had only a small effect on yield. Differential manuring had no marked effect on hop resins, but high K tended to increase, and high N to depress, the resin content of the cones. There was no appreciable difference in yield response between an "inorganics only" manurial treatment and one of "dung + inorganics" calculated to supply the same total quantities of N, P, K and Mg. Dung had no beneficial effect on resin content but increased soil organic matter and improved soil structure. [From author's summary.]—Wye Coll., Kent.

2830. PASTÝŘIK, V.
Zkušenosti se zavlažováním chmelnic. **(Experiments on irrigating hop gardens.)**
Chmelařství, 1960, **33**: 43.

Irrigation in a small garden containing breeding material increased yields from 1·47 to 1·87 kg. per plant.

2831. PETRLÍK, Z.
Větší pozornost klasovitým výhonům! **(Greater attention to mildewed shoots.)**
Chmelařství, 1960, **33**: 77, illus.

A note on the early removal and destruction of affected hop shoots, before the conidia are visible, i.e. when downy mildew infection can only be recognized by the deformed and yellowing leaves.

2832. PETRLÍK, Z.
Úspornými postřiky proti peronospoře. **(Economic spraying against [hop] downy mildew.)**
Chmelařství, 1960, **33**: 10-11, illus.

Three low-volume applications of 3% Kuprikol (30% copper oxychloride) gave 98·5–99·2% healthy cones without being phytotoxic. This is, however, considered to be the maximum safe concentration, and in dry summers it should be reduced to 2% with an appropriate increase in volume. The low-volume copper sprays can be combined with systemic insecticides for the simultaneous control of aphids and mites.

2833. PETRLÍK, Z., AND ŠTYS, Z.
Organické fungicidy v provozu. **(Organic fungicides in use.)**
Chmelařství, 1960, **33**: 22.

Kuprikol at 1% gave slightly better control of hop downy mildew than did the dithiocarbamates Novozir N and Novozir L at 1%, but the organics produced better cone colour and are recommended for use in seasons of mild to moderately severe infection. [For earlier work see *H.A.*, 30: 4099.]

2834. STANĚK, M., AND PETRLÍK, Z.
Antibiotika v ochraně před peronosporou. **(Antibiotics for the control of [hop] downy mildew.)**
Chmelařství, 1960, **33**: 41-2, illus.

In preliminary trials Acti-dione applied as an aerosol at 0·075% in 6 l. oil per ha. gave very good control of downy mildew on hops but was phytotoxic, damaging mainly leaves at a height of 2–4 m., i.e. those near the outlet of the tractor-mounted generator. [See also *H.A.*, 30: 4101.] The possibilities of applying Acti-dione in low-volume water-sprays are considered.

2835. KŘÍŽ, J.
Letadly proti mšici a svilušce. **(Aeroplanes against aphids and mites.)**
Chmelařství, 1960, **33**: 40-1, illus.

Two aeroplane applications, in June and July, of an aerosol containing 10% Intration (a systemic) in oil (550 g. active ingredient in a dosage of 5.7 kg. per ha.) gave commercial control of aphids and mites on hops throughout the season.

2836. KŘÍŽ, J., AND DUŠKA, J.
Nové zkušenosti se zálivkami chmele Dimefoxem. **(New experiments on watering hops with dimefox.)**
Chmelařství, 1960, **33**: 11-12, illus.

Dimefox, either as Terra Sytam or S14, watered onto the crowns at 100 ml. per hill between 27 May and 10 June gave adequate control of aphids and mites up to picking time. Applications made earlier began to lose their effectiveness sooner. In a test on the growth stimulating effect of the systemics, S14 at 2% increased yields by an average of 26·44% over the controls which had been treated with Ekatin.

2837. TOŠKOV, V.
Poloautomatický dávkovač na zálivku chmele. **(A semi-automatic applicator for treating hops.)**
Chmelařství, 1960, **33**: 23, illus.

Dimefox, either as Terra Sytam or S14, was applied successfully onto the crowns of hop plants for aphid and mite control by a hand operated applicator delivering doses of 100 ml. Two applicators, 127 cm. long (to obviate stooping) and weighing 2·2 kg., are connected by hoses to a pressurized supply tank on a small Holder tractor; the maximum output of each is 34 doses per minute with only 0·5% loss of liquid.

2838. ZAJÍČEK, E.
Vývoj mechanizované sklizně chmele. **(The development of mechanical harvesting of hops.)**
Chmelařství, 1960, **33**: 25-6, and 43-5, illus.

A comparison of the performances of the hop-picking machines Bruff, Rotobank, Allaeys and ČCH1.

2839. FRIC, V., AND TOŠKOV, V.
Nová technologie sušení chmele na pásové sušárně. **(New technology of hop drying on a conveyor drier.)**
Chmelařství, 1960, **33**: 12-14.

No substantial differences were found in the quality of hops dried in a conventional kiln and in a 3-band continuous drier. The process of continuous drying differs from the conventional method in that the hops on all bands are dried at approximately the same temperature, thus exposing the fresh hops to higher temperatures. In the kiln the temperature did not exceed 50° C. In the drier temperatures ranging from 50 to 65° C. were tested, and 50–55° C. was found the most satisfactory. Under normal working conditions the maximum average hourly output of the drier was 342 kg. of fresh hops dried to 6·2% moisture content, or in other words 83 kg. of dry hops. The costs of the two methods of drying are compared.

2840. BROHULT, S., AND OTHERS.
Mass spectrometric studies of hop bitter substances.
Proc. Eur. Brew. Conv., Rome, 1959, pp. 121-7, from abstr. in *Wallerstein Lab. Commun.*, 1960, **23**: 150.

Mass spectra are given for lupulone, humulone and one of the hulupones after separation by reversed-phase partition chromatography. The chemistry of the hulupones is described.

2841. MIKSCHIK, E.
Iodoform reaction of hop bitter acids.
Proc. Eur. Brew. Conv., Rome, 1959, pp. 138-48, from abstr. in *J. Inst. Brew.*, 1960, **66**: 421-2.

A discussion of the chemical mechanism.

2842. SPETSIG, L. O., AND STENINGER, M.
Hulupones, a new group of hop bitter substances.
J. Inst. Brew., 1960, **66**: 413-17, bibl. 16.

Containing a five-membered ring and showing affinities with oxyhumulinic acid.

Insecticidal plants.

2843. LAUW ING KOEN, AND OEI HONG PENG.
Ichtisar mengenai Leguminosae-rotenon beserta lain² rotenoida dan arti untuk Indonesia pada dewasa ini. (**A review of some Leguminosae containing rotenone derivatives and their importance today for Indonesia.**) [English summary 18 lines.]
Menara Perkeb., 1960, **29**: 163-74, bibl. 64.

Not only *Derris elliptica*, but several rotenone-containing cover crops and shade trees, including *Mundulea sericea*, *Tephrosia vogelii*, *Pachyrrhizus erosus* and *Albizzia chinensis*, may be of economic importance as sources of insecticides. Chemical details are given of several rotenone derivatives.

2844. FIKENSCHER, L. H.
Het voorkomen van nicotine in het genus *Acacia*. (**Nicotine in the genus *Acacia*.**)
Pharm. Weekbl., 1960, **95**: 233-5, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 54,216.

The main volatile base of the phyllodes of a species of *Acacia* (*A. retinodes*?) is identical with nicotine.—Univ. Leyden.

2845. MARTIN, J. T.
Pyrethrum cultivation in England, 1925-37.
Ann. appl. Biol., 1960, **48**: 837-46, bibl. 14.

Small plot and field experiments on the cultivation of pyrethrum in various parts of England showed that the plants grow well and produce satisfactory yields of flowers of high pyrethrin content; costings of the field trials, however, showed that the crop was uneconomic. Individual plants grown from seed differed considerably in growth habit and in the pyrethrin content of their flowers. [From author's abstract.]—Long Ashton Res. Stat., Bristol.

2846. GULATI, K. C., AND DEWAN, R. S.
Screening of pyrethrum flowers. Relationship between total pyrethrins, ether extractives and alkali consumed by the extractives.
Indian J. agric. Sci., 1959 (issued 1960), **29**: 49-51, bibl. 9.

A fairly good linear relationship was established between total pyrethrins, percentage extractives, alkali neutralized by free acids, alkali neutralized by chrysanthemum carboxylic acids and total alkali titre.—Indian agric. Res. Inst., New Delhi.

2847. LEVY, L. W., AND OTHERS.
Formation of pyrethrins in detached pyrethrum flowers.
Pyreth. Post, 1960, **5**(4): 3-6, bibl. 8.

In six experiments detached flowers were exposed to $C^{14}O_2$. Later examination showed radioactivity in certain fractions containing pyrethrins.—Esc. politéc. nac., Quito, Ecuador.

2848. STEPHENSON, H.
The separation and estimation of the four insecticidal constituents of pyrethrum, *Chrysanthemum cinerariaefolium*, by elution chromatography on a column of adsorptive charcoal.
Pyreth. Post, 1960, **5**(4): 22-30, bibl. 18.

Separation and quantitative estimation of pyrethrins I and II and cinerins I and II.

Rubber plants.

2849. GONZÁLEZ GÓMEZ, C., GALLEGO Y GÓMEZ, F., AND SWIATOPOLK-MIRSKI, A.
Un aspecto de las posibilidades de utilización del caucho de *Asclepias syriaca* L. de producción española. (**A review of the possibilities of utilizing the rubber from Spanish grown *Asclepias syriaca*.**) [French and English summaries 7 lines each.]
Farmacognosia, 1960, **20**: 205-14, bibl. 10.

Certain Spanish clones of *Asclepias syriaca* contain over 19% of resinous rubber in their leaves, with a rubber/resin ratio almost exactly unity. Extraction and vulcanization are described.

2850. Ramos, J. L.
Production de caoutchouc naturel dans les zones tempérées. **(Natural rubber production in temperate countries.)**
Rev. gén. Caoutch., 1960, **37**: 962-5, illus.

Reviews the experimental work on guayule carried out in Spain during the past 15 years, and compares the physical and chemical properties of guayule and hevea rubber.

Seed oils.

(*See also* 1753, 1754, 2163, 3604.)

2851. Rao, B. Y.
Literature review on oils and fats, 1958.
[*Publ.*] *Cent. Food tech. Res. Inst., Mysore*, 1960, pp. 96, bibls extensive.

Reviews and bibliographies on production, extraction, chemistry and utilization.

2852. Suslov, V. M.
The All-Union Institute for oil and essential oil crops. [Russian.]
Vestn. sel'sk. Nauki, 1960, **5**(6): 95-8.

A short report on the work of the Institute in increasing the oil contents of vegetable-oil and essential-oil plants, and on hybrids which have proved commercially superior as well as more resistant to diseases and pests.

2853. Stone, W. J., and Culp, T. W.
Effects of diseases on castorbeans in Mississippi.
Plant Dis. Reptr, 1959, **43**: 827-9, bibl. 3, illus.

Diseases have proved the limiting factor in castor bean production in Mississippi. It is unlikely that chemical control will be economic, hence control must be obtained by growing resistant varieties.—U.S.D.A., and Miss. agric. Exp. Stat., Stoneville.

2854. Brigham, R. D., and Spears, B. R.
Castorbeans in Texas.
[*Publ.*] *Tex. agric. Exp. Stat.* **B-954**, [1960], pp. 11, illus.

Botany, varieties, cultivation, pest and disease control and mechanization of harvesting described.

2855. Montalvo S., R.
La poda en la variedad Chocolate de higuerilla. **(Pruning the castor variety Chocolate.)**
Inf. mens. La Molina, 1959, **33**(386): 1-7, bibl. 2.

Topping carried out on 2-month-old plants of this perennial castor variety reduced the main stem to 1, 0·75 or 0·5 m. Only after the lowest topping was the final plant height sufficiently low to facilitate harvesting, but a 13% reduction in yield offset this advantage. High and medium topping gave seed yield increases of 9 and 13% respectively. The lower the topping, the more marked was the delay in flowering. Composition figures are given for the seeds, and for the oil-cake used as fertilizer or fodder.

2856. Scott, F. L., Sjaholm, V., and Bowler, E.
Light and electron microscope studies of the primary xylem of *Ricinus communis*.
Amer. J. Bot., 1960, **47**: 162-73, bibl. 16, illus.

2857. St. Angelo, A. J., Ory, R. L., and Altschul, A. M.
Lipases and a lipase inhibitor in seeds of *Ricinus communis*.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xvi.

2858. Altman, R. F. A., Seixas, A. B., and de Souza, H. B.
Le curupira, remarquable oléagineux d'Amazonie. **(Curupira, a remarkable oil plant of Amazonia.)**
Oléagineux, 1960, **15**: 555-64, bibl. 32, illus.

The forest tree, *Curupira tefeensis;* the chemical characteristics of the seed oil are described.

2859. Balbi, G.
L'olio di perilla nella fabbricazione di prodotti vernicianti. **(Perilla oil in the manufacture of paints and varnishes.)**
Olearia, 1958, **12**: 243-50, bibl. 40, illus.

Composition, properties and uses.

2860. Hore, H. L., and Sims, H. J.
Safflower trials in the Victorian wheat belt.
J. Agric. Vict., 1960, **58**: 407-10, bibl. 8, illus.

The uses, general agricultural characteristics and agronomic requirements of safflower are discussed. Oil contents of varieties tested ranged from 27 to 38%, and over a 4-year period safflower outyielded linseed.

2861. Yermanos, D. M., and Knowles, P. F.
Effects of gibberellic acid treatment on safflower.
Agron. J., 1960, **52**: 596-8, bibl. 13, illus.

Foliar sprays of GA were applied to field plantings of 5 commercial varieties at 10 and 100 p.p.m. and at different stages of development. Applications before flowering induced rapid internode elongation and chlorosis. Abnormalities in the development of the inflorescence resulted in various degrees of sterility. Treated material was up to 8 days earlier and 8 in. taller than the controls. Yield and oil content were depressed, but seed weight and iodine number were not affected. Susceptibility to phytophthora root rot was increased, particularly in resistant varieties. [From authors' summary.]—Univ. Calif., Davis.

2862. THOMAS, C. A.
Effect of storage time and temperature on control of seed-borne safflower rust by volatile mercury fungicides and the efficacy of certain seed protectants and antibiotics.
Plant Dis. Reptr, 1959, **43**: 1250-2, bibl. 7.

Fungicides tested as seed protectants against *Puccinia carthami* were all successful, particularly at relatively high dosages. Acti-dione was the only material showing phytotoxicity. The efficiency of volatile mercury compounds was improved by increasing the dosage and the storage temperature. —U.S. Dep. Agric.

Sugar maples.

2863. GIESE, R. L.
An insect complex and defoliation associated with sugar maple *Acer saccharum* (Marshall) and the genesis of maple blight.
Diss. Abstr., 1960, **21**: 403, being *L.C. Card No. Mic.* 60-3200 of 226 pp.

Symptoms of maple blight, namely wilt, dieback, epicormic sprouting and tree mortality, were induced by artificial defoliation. Defoliation effects were most severe in July and August, which is the peak period of leaf-eating activity by leaf-roller and webworm insects. The major species studied were *Sparganothis acerivorana*, *Acleris chalybeana* and *Tetralopha asperatella*.—Univ. Wis.

2864. CHING, T. M., AND MERICLE, L. W.
Some evidences of premature stoppage of sugar maple sap production.
For. Sci., 1960, **6**: 270-5, bibl. 12, illus.

Histological findings indicated that premature stoppage of sap flow in normally tapped trees resulted from the combined effects of a bacterial invasion of the living tissue *via* pits along the cell walls and an actual vessel blockage by microorganisms, with or without gummy plugs produced by these organisms. A demonstration of pectolytic activity by bacteria isolated from tap holes suggests a means whereby the bacteria penetrate the pit membrances. [From authors' summary.]—Ore. St. Coll., Corvallis, and Mich. St. Univ., E. Lansing.

2865. ARNOLD, E. L.
Using water pumps for gathering maple sap.
Bull. Vt agric. Exp. Stat. **616**, 1960, pp. 23, illus.

Laboratory and field tests of a pump equipped with a controlled by-pass and of a jet-assisted pump, which are described, showed that the latter was superior, since it produced a higher vacuum in the suction hose and emptied the buckets faster. [See also *H.A.*, 30: 4140.]

2866. ROBBINS, P. W.
The yield of maple sap per taphole.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **43**: 142-6, bibl. 16.

Records an average yield from 92 trees over 4 years of 19 gal. sap (3·62 lb. sugar) per tap hole.

Tannin plants.

(*See also* 3299.)

2867. WATTLE RESEARCH INSTITUTE, PIETERMARITZBURG.
Report of the Wattle Research Institute, Pietermaritzburg, for 1959-1960, 1960, pp. 48, illus.

Silviculture: The highest yields of tannin per acre were obtained from 11-year-old trees at a density of 600 per acre, from 9-year-old trees at 800 per acre and from 7-year-old trees at 1,100 per acre. The best yield of seedlings was obtained where the lowest number (60) of shelterwood trees was used. *Chemistry:* Both phosphate and potash gave significant and profitable increases in yield; superphosphate was the most effective form of P, applying the full amount below the seed before sowing being the best method. Two progress reports are abstracted separately; a third lists 23 insect species found damaging wattle plantations.

2868. MOFFETT, A. A., AND NIXON, K. M.
Induced tetraploidy in black wattle (*Acacia mearnsii* de Wild.).
A.R. Wattle Res. Inst., Pietermaritzburg, 1959-60, 1960, pp. 32-8, bibl. 3.

Tetraploids, most readily induced by soaking seeds in 0·02–0·03% colchicine for 24 hours or in 0·01–0·02% colchicine for 48 hours, were much less vigorous than diploids and many trees lacked apical dominance. Although the bark thickness and tannin content were greater, yields per acre were likely to be less owing to less vigorous growth.

2869. OSSOWSKI, L. L. J.
The biological control of the wattle bagworm, *Kotochalia junodi* (Heyl.), by a virus disease. II. Large scale experiments.
Ann. appl. Biol., 1960, **48**: 299-313, bibl. 8.

With infestations in the prodromal stage and the larvae in their first instar at the time of treatment, mortality was similar with suspensions of virus containing 1,000 or 500 polyhedra/mm.^{3}. Mortality was less with 250 polyhedra/mm.^{3}, but still high enough to keep the crowns of the infested trees green. Against older larvae, the initial mortality was too low to prevent defoliation, but 9 months after spraying the mortality had increased sufficiently to reduce the infestation to its latent stage. Where virus was applied during the eruptive stage there was a very high initial mortality, and defoliation of trees was light, whereas untreated trees were completely defoliated. Nine months after spraying, however, mortality was equally high in treated and untreated plantations. Virus introduced from a distant source was more effective than local strains, and at the prodromal stage was more successful in preventing defoliation and loss of yield. Methyl cellulose, used as a sticker, did not affect mortality, but skim-milk powder decreased it. Artificially disseminated virus can also spread to neighbouring blocks in the years following treatment. [From author's abstract. For part I, see *H.A.*, 27: 3712.]—Wattle Res. Inst., Pietermaritzburg, S.A.

2870. GORDON-GRAY, C. G., AND JONES, R. A.
The significance of sub-standard bark in the production of wattle extract.
A.R. Wattle Res. Inst., Pietermaritzburg, 1959-60, 1960, pp. 39-43, bibl. 2.

The green bark of the top 9 ft. of strippable bark was found to contain a lower tan : non-tan ratio in the extract, and, since it only amounts to a fifth of the total bark, could be discarded at the beginning of the season when difficulty in producing extract of the requisite tan : non-tan ratio is experienced.

Sundry plants.

2871. TŌNO, T., AND ONO, K.
Studies on bamboo culm and its fiber as cellulose material. Part I. Microscopical studies on bamboo culm and its fiber.
Bull. Univ. Osaka Pref., Ser. B, 1960, **10**: 25-32, bibl. 8, illus.

In *Phyllostachys reticulata*, *P. edulis*, *Pleioblastus simoni*, *Dendrocalamus strictus* and *Melocanna bambusoides*.

2872. NOGUEIRA PRISTA, L., AND OTHERS.
Cassia occidentalis L. Estudo dos seus compostos antraquinónicos. (***Cassia occidentalis.*** **A study of its anthraquinone components.)**
Garcia de Orta, 1959, **7**: 757-72, bibl. 33, from *Trop. Abstr.*, 1960, **15**, Abstr. h1823.

Samples of roots, seeds and leaves collected in Angola, Guinea and São Tomé all contained appreciable amounts of free anthraquinones. The values were much the same after hydrolysis in acid solution. The Guinea seed samples had the highest content, which appears to be influenced by climate.

2873. WILLIAMS, L. O.
Ucuuba and related wax-like vegetable tallows.
[German summary 7 lines.]
Qual. Plant. Mater. veg., 1960, **7**: 295-6.

Vegetable tallows originating at Belém do Pará are mostly from *Virola surinamensis*; those originating from Colombia are from *Dialyanthera otoba*; and tallow from southern Brazil is from *Virola sebifera* or from *V. oleifera*. [From author's summary.]

FLORICULTURE.

General.

(*See also* 1725, 1827, 1859, 2333, 2340, 3558, 3577, 3586, 3588.)

2874. HARRISON, A. D.
Trends in commercial flower production under glass.
N.A.A.S. quart. Rev., 1960, **12**: 63-7.

Some new practices in growing carnations, chrysanthemums, freesias and poinsettias are reviewed, including the specialized production of carnation and chrysanthemum cuttings.

2875. SCHEER, C. D.
Ontwikkeling van teelt, handel en verbruik van bloemen in Italië. (**Developments in the growing, marketing and use of flowers in Italy.**)
Meded. Dir. Tuinb., 1960, **23** (Suppl.), pp. 87, bibl. 30, illus.

A detailed survey.

2876. HOFMAN, N. C.
Bloementeelt en -handel in de Verenigde Staten. (**Flower growing and marketing in the United States.**) [English summary ⅓ p.]
Meded. Dir. Tuinb., 1960, **23**: 721–34, illus.

A survey, with emphasis on the more important cut flower crops.

2877. BAKER, K. F.
Production of ornamental plants in California, 1949-1958.
Mag. Calif. St. Flor. Ass., 1960, **9**: 4-19, bibl. 10.

Data illustrating the expansion of the industry and its distribution throughout the state.

2878. DIMOCK, A. W., AND OTHERS.
1960 Cornell recommendations for commercial floriculture crops.
Publ. N.Y. St. Coll. Agric., revised 1960, pp. 63.

Cultural and insect and disease control recommendations for many flower crops.

2879. CAMPBELL, J. S.
Flowers from the tropics.
World Crops, 1960, **12**: 461-3, 466, illus.

Faster and cheaper air-freight has made the open-air cultivation of frost-susceptible flowering plants in the tropics competitive with glasshouse culture in temperate zones. Centres of production, suitable flower types and packing are discussed.

2880. PEYRON, L.
Les fleurs dans la philatélie mondiale. **(Flowers in world philately.)**
J. Agric. trop. Bot. appl., 1960, **7**: 145-68.

A catalogue based on botanical names of ornamental and economic plants grouped in families.

2881. Kurnatowski, G.
How pot plants fare in pounds and shillings.
Grower, 1961, **55**: 225-8.

The costs are given in detail of growing a thousand plants each of cyclamen and cineraria, with the percentages of the 4 main items (labour, materials, heating and marketing).

2882. Stranger, J. H., Millard, R., and Asprey, G. F.
Automation in the greenhouse. A new approach.
Gdnrs' Chron., 1960, **148**: 312-13, illus.

Gloxinia plants were grown in a box, 8 ft. × 2 ft. 6 in. × 2 ft. 3 in. deep, with an electric soil heater in the lower half and a 20-ft. length of perforated plastic hose surrounded by a plastic sleeve 6 in. below the surface of the rooting medium. The box was irrigated twice daily with water containing a liquid fertilizer concentrate. The rooting medium was covered with a black polythene sheet, with the plants inserted through crosses cut in it. Remarkable growth was obtained using this method, which required no attention apart from recharging with fertilizer. Other advantages are discussed.—Univ. Coll., Cardiff.

2883. (Joiner, J. N.)
Peat pots best container for seedlings, University tests indicate.
Flor. Exch., 1960, **135**(15): 11, and (17): 11.

Seedlings of calendula, snapdragon and petunia made more growth up to the time of transplanting in peat pots and asphalt plants bands than in clay or aluminium pots. Peat pots weie the easiest to work with. Final measurements, however, showed no differences in the fresh and dry weights of snapdragon seedlings raised in different pots. However, calendulas raised in peat pots and asphalt bands and petunias raised in peat pots had heavier fresh weights than plants raised in other pots. Frequency of watering the seedlings had little or no effect on extension growth or on the fresh or dry weights of the plants after transplanting.—Univ. Fla, Gainesville.

2884. Ono, H.
The effect of gibberellin on the cultivation of some florists' crops. No. 1. [Japanese, with English summary ⅓ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 71-6, bibl. 4, illus.

Some elongation of the flower stalk and acceleration of flowering occurred in all the crops sprayed with gibberellin, but the greatest response was shown by summer chrysanthemum varieties growing under unfavourable conditions and by freesias growing under favourable conditions. Good quality cut flowers were produced by callas, but the quality of stock flowers was poor. When soil moisture was low, 14% of the treated callas produced malformed flowers.

2885. Dörr, G.
Gibberellin-Spritzversuche an Zierpflanzen. **(Spraying trials with gibberellin on ornamental plants.)**
Gartenwelt, 1960, **60**: 403-4, illus.

Spraying trials were carried out with the preparation Gibboe-Riedel de Haën. (1) With the hydrangea variety Schwester Therese the treatment enhanced extension growth and induced earlier flowering, but the appearance of the plants and their keeping quality suffered. (2) One-year-old cyclamen plants did not respond to the treatment. (3) Treated gloxinia plants appeared to be stronger than the controls but did not flower earlier.—Staatl. Lehr- u. Versuchsanst. Gartenb., Heidelberg.

2886. Decoux, L.
La pélorie, source de nouveautés florales? **(Peloria, a source of new flowers?)**
Ann. Gembl., 1960, **66**: 235-46, bibl. 15, illus.

A review [peloria is the development of actinomorphic symmetry in normally zygomorphic flowers].

2887. Raabe, R. D., and Sciaroni, R. H.
Root rots of container grown plants—new fungicides used as soil drenches.
Flor. Exch., 1960, **135**(20): 46-8.

A progress repoıt is given on the use and efficiency of 8 new soil sterilants (including one mixture) for controlling soil fungi likely to attack container-grown plants. The test plants included African violet, cyclamen, gloxinia, poinsettia and heather. —Univ. Calif., Berkeley.

2888. Sher, S. A.
Chemical control of plant parasitic nematodes in plant roots.
From abstr. in *Phytopathology*, 1960, **50**: 654.

A number of chemicals were tested to find a dip treatment for bare root nursery stock infested with plant-parasitic nematodes. Thimet was effective in eliminating *Pratylenchus* spp. from rose, orchid and cherry when used at 1·0% for 30 minutes. Diazinon at 1·0% for 30 minutes was effective in eliminating *P. penetrans* from cherry seedlings. *O*,*O*-diethyl-*O*-2-pyrazinyl phosphorothioate and Nemagon at 0·25% for 30 minutes were effective in killing *P. vulnus*, but were phytotoxic to roses. Dimethoate, Phosphamidan and Ortho-dibromo 8 were effective in a similar test at 4·0% for 30 minutes. Malathion, Dylox, Delnav and 2,3-dibromopropyl methyl ether were ineffective. None of the above chemicals eliminated *Meloidogyne* spp. from tomatoes, gerberas or Shasta daisies when used at 0·25 and 1·0% for 5–30 minutes.

2889. Smith, F. F.

Greenhouse insect control.

Pa Flower Grs' Bull., 1960, No. 111, reprinted in *Ill. St. Flor. Ass. Bull.*, 1960, No. 207, pp. 5-6.

Tables listing pests of ornamentals and insecticides with recommended rates.

Annual and herbaceous plants.

(*See also* 1692, 1702, 1722, 1748, 1749, 1758, 1778, 1790, 1864, 2637, 2724, 2741, 2874, 2881, 2883, 2884, 2887, 2888, 3469, 3572-3574, 3578, 3595, 3597.)

2890. Kühle, G.

Der Einfluss des Kultursubstrates auf den Ertrag von *Anthurium scherzerianum*. **(The effect of the medium on the yield of *Anthurium scherzerianum*.)**

Dtsch. Gartenb., 1960, **7**: 273-6, illus.

Sphagnum peat gave significantly better results as a medium for *Anthurium scherzerianum* than did the customary standard soil mixture. The optimum pH value of the medium lay between 4 and 5. Gravel culture did not show any advantages over standard soil, but can be recommended as an alternative where suitable soil is in short supply. The experiments have also shown that full yields of *A. scherzerianum* cannot be expected before the 4th year.—Inst. Gartenb., Dresden-Pillnitz.

2891. Hagen, C. W., Jr.

Flavonoid compounds in a differentiating system; development of mature pigmentation in petals of *Impatiens balsamina* L.

From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xviii.

In red flowers the flavonoid compounds developed sequentially rather than simultaneously, leucoanthocyanins appearing before flavonols, and flavonols before anthocyanins. The major anthocyanin was an acylated 3,5-glycoside of pelargonidin. In flowers of other genotypes this sequence of development was modified in minor ways.—Indiana Univ., Bloomington.

2892. Kaven, E.

Neue Arbeitsverfahren für die Kultur von Edelnelken. **(New methods for carnation growing.)**

Gartenwelt, 1960, **60**: 401-2.

Jiffy pots and multipots are shown to be less demanding of space, soil and time and are lighter than clay pots; in spite of their relatively high cost, therefore, they are considered preferable to clay pots. Labour can also be saved by providing a prefabricated wire framework for support and by using automatic watering.—Bundesversuchs- u. Prüfungsanst. landw. Maschinen, Wieselburg/Erl., Austria.

2893. Eck, P.

Continuous solution feeding: planned carnation nutrition.

Mass. Flower Grs' Ass. Bull., reprinted in *Flor. Exch.*, 1960, **135**(11): 17, 19.

In tests with liquid fertilizers on carnations 200 p.p.m. each of N and K gave the best growth and quality of 24 treatments. At these levels adequate soil reserves were maintained. The N content of carnation plants increased with increasing N applications up to 120 p.p.m. Plant K contents increased with applications up to 200 p.p.m. Flower quality was particularly poor with applications above 260 p.p.m. N and below 50 p.p.m. K. The soil pH gradually dropped at the highest level of N fertilization. The addition of 0·5 p.p.m. B to the fertilizer solution is recommended. A table is given of possible fertilizer combinations that provide optimum amounts of N and K.—Waltham Field Stat., Univ. Mass.

2894. Gasiorkiewicz, E. C.

Influence of nitrogen and potassium nutrition levels on the development of *Fusarium* systemic wilt of carnations.

From abstr. in *Phytopathology*, 1960, **50**: 636.

Cultivars of the variety William Sim were grown under 6 N and 4 K concentrations. High N (150 and 200 p.p.m.) increased wilt severity. Root symptoms were most severe with the low-K treatments (15 and 30 p.p.m.), and increasing the K concentration retarded losses. High N and low K encouraged disease development.

2895. Petersen, L. J., Baker, R., and Skiver, R. E.

Control of *Fusarium* stem rot of carnations: I. Application of fungicides to mother blocks.

Plant Dis. Reptr, 1959, **43**: 1204-8, bibl. 6, illus.

The manganese salt derivative of pyridinethione (OM 1564) was the most effective of several fungicides sprayed on carnation mother blocks to control *Fusarium roseum* f. *cerealis*. Rooting of cuttings from the OM 1564-treated blocks was significantly stimulated by 8 applications.—Colo. St. Univ., Fort Collins.

2896. Petersen, L. J., and Baker, R.

Control of *Fusarium* stem rot of carnations: II. The use of dips and drenches.

Plant Dis. Reptr, 1959, **43**: 1209-12, bibl. 3, illus.

Another account of work described in *H.A.*, 29: 694.

2897. Whitcomb, W. D.

Carnation pests: their control.

Flor. Exch., 1960, **134**(25): 13, 40-1.

Control of mites, insects, symphilids, slugs and snails.

2898. Pritchard, A. E.
Aphid control on carnations.
Calif. Agric., 1960, **14**(10): 15.

A brief note reporting the promise shown by Dimethoate applied at 5–6 lb. technical material per acre.

2899. Goodland, N. L.
"Precision"-growing of chrysanthemums.
Gdnrs' Chron., 1960, **148**: 310-11, illus.

The technique of all-the-year-round flower production employed by a grower in Hampshire.

2900. Stinson, J. J., and Seeley, J. C.
Foliar fertilization of chrysanthemums.
Flor. Exch., 1960, **135**(17): 12-14, bibl. 3, illus.

Immersing the foliage of chrysanthemums in urea (4 g./l.) twice a week resulted in better linear growth during a 14-week period than less frequent immersions of foliage or than soil applications of urea. Linear growth was not affected by the frequency of application of solutions containing P and/or K, and for these two elements soil applications were more efficient than foliar applications.—Pa St. Univ.

2901. Vince, D.
Low temperature effects on the flowering of *Chrysanthemum morifolium* Ramat.
J. hort. Sci., 1960, **35**: 161-75, bibl. 17, illus.

Low night temperatures of 40–50° F., given before the bud was visible, were found to delay flowering in several glasshouse varieties when compared with a steady temperature of 60° F. Low night temperatures given during long-day treatment usually caused an increase in the number of leaves to the bud, but when given during short-day induction no such increase was evident. Reduced light intensity markedly delayed flowering if it occurred during short days but not if it occurred during long days. Flower diameter was increased by low night temperature and was primarily determined by the temperature after the buds became visible macroscopically. When light intensity and temperature were favourable, flower diameter was greater when short-day induction consisted of 14-hour, followed by 13-hour, photoperiods than when 8-hour photoperiods were provided; the former day-length treatment, however, delayed flowering.—Univ. Reading.

2902. Sachs, R. M., and others.
Shoot histogenesis: subapical meristematic activity in a caulescent plant and the action of gibberellic acid and Amo-1618.
Amer. J. Bot., 1960, **47**: 260-6, bibl. 21, illus.

Vegetative, rooted cuttings of *Chrysanthemum morifolium* vars Crystal Queen and White Top were immersed for 24 hours in solutions of Amo-1618 (100 mg./l.) or GA (100 mg./l.) or in a mixture of the two or in water. Mitotic activity in the apical and sub-apical meristems and the rate of leaf initiation were recorded. Amo was found to inhibit cell division in the sub-apical meristem, producing rosette plants, and GA to act in antagonism, producing a normal caulescent habit. It is suggested that Amo or related substances occur naturally. [See also *H.A.*, 30: 1562.]—Univ. Calif., Los Angeles.

2903. Cathey, H. M.
Phosfon and CCC for controlling height of chrysanthemums.
Flor. Exch., 1960, **135**(21): 12-13, bibl. 6, illus.

Two quaternary ammonium compounds, Phosfon (2,4-dichlorobenzyltributyl phosphonium chloride) and CCC ((2-chloroethyl)-trimethylammonium chloride), retarded chrysanthemum growth, but Phosfon was much more effective than CCC. Increasing the amount of Phosfon in a potting soil from 0·16 g. to 0·8 g. per cu. ft. reduced the height of the plants by about 2·4 in. and increased the days to flowering by 7. Responses to Phosfon were affected by both variety and soil type. Several methods of application were tested, but foliar sprays and dipping or soaking rooted cuttings are not recommended. Phosfon was particularly persistent in the soil, its availability being unaffected by steam sterilization or wetting agents, and its growth retarding effect lasted for 5 successive crops. Phosfon mixed with the potting soil also continued to retard growth after the chrysanthemums were planted out in an open border.—U.S.D.A., Beltsville, Md.

2904. University of California.
Chrysanthemum disease control recommendations.
Flor. Exch., 1960, **135**(23): 10-11.

Tabulated information on 18 diseases, their symptoms, spread, effect of environment and control.

2905. Hollings, M.
American stunt virus in English chrysanthemum stocks.
A.R. Glasshouse Crops Res. Inst. 1959, 1960, p. 104, illus.

Diagnostic features and methods of testing for the virus are described.

2906. Anon.
Mass production methods used to hot water treat chrysanthemums.
Comm. Gr, 1960, No. 3390, pp. 1344-5, illus.

The methods used on a Lincolnshire nursery are described, by means of which up to 45,000 stools may be treated in a day. In addition to controlling eelworm the treatment induces better vigour and flowering the following season.

2907. Orans, M.
Geranium crook neck can be eliminated.
Flor. Exch., 1960, **135**(23): 8, 40.

Crook neck is a chimaeral mutation of the carpel, which appears in many varieties of the French strain of bedding geraniums. It has been produced artificially by exposing plants to radiation. Commonly branches on one side of the plant only will show crook neck; therefore cuttings should be taken from the non-mutated side.

2908. Saksena, H. K., and Singh, B. B.
Blight of marigold, *Tagetes erecta*, caused by *Colletotrichum capsici* (Syd.) Butl. & Bisby.
Plant Dis. Reptr, 1959, **43**: 670-3, bibl. 8, illus.

Symptoms of attack by *Colletotrichum capsici* on marigold are described. Preliminary control experiments have shown that infection can be reduced by preventive applications of 1% bordeaux or 2% zineb.—Govt agric. Coll., Kanpur, India.

2909. Milner, H. W., and Hiesey, W. M.
Difference in photosynthetic response of climatic races.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): viii.

Three climatic races of *Mimulus cardinalis* differed in their temperature and light intensity requirements for maximum photosynthesis and in their rate of photosynthesis in different CO_2 concentrations.—Carnegie Instn Wash., Stanford, Calif.

2910. McQuown, F. R.
Some experiments with morning glories.
Gdnrs' Chron., 1960, **148**: 522.

Observations showed that chipping the seeds of *Pharbitis tricolor* (*Ipomoea rubro-caerulea praecox*) much improved the germination percentage. A leaf chlorosis of *Pharbitis tricolor* and *P. purpurea* was most successfully corrected by applying sulphate of ammonia, sulphate of potash and Epsom salts; separate applications of each fertilizer were less successful.

2911. Nakayama, S., Borthwick, H. A., and Hendricks, S. B.
Failure of photoreversible control of flowering in *Pharbitis nil*.
Bot. Gaz., 1960, **121**: 237-43, bibl. 10, illus.

Flowering of seedlings of Japanese morning-glory, *Pharbitis nil*, is inhibited by far-red and repromoted by red irradiations at the beginning of 16-hour dark periods, and inhibited by both red and far-red irradiations at the middle of such dark periods. Older plants are not responsive to red or far-red irradiations at the beginning of the dark period, but, at the middle, red inhibits flowering and far-red repromotes it. Seedlings irradiated at the beginning of the dark period flower if at least one cotyledon is either not irradiated with far-red or is irradiated with red after far-red. Flowering of seedlings following irradiation at the middle of the dark period occurs only if one cotyledon is not irradiated. The energies required at the beginning of the dark period for half-saturation of the far-red and red responses are similar in value to those required for reversible control of flowering of other photoperiodic plants near the middle of inductive dark periods. Approximately the same energies are required for control of flowering by red radiation at the beginning and near the middle of the inductive dark periods. The flowering response induced by red radiation near the middle of the dark period is not reversible by far-red radiation and is opposite to the response induced at the onset of darkness. About 4 hours in darkness are required for the plant to change from the one to the other type of response. [From authors' summary.]—Plant Ind. Stat., Beltsville, Md.

2912. Linskens, H. F., Schrauwen, J. A. M., and van den Donk, M.
Überwindung der Selbstinkompatibilität durch Röntgenbestrahlung des Griffels. **(Self-incompatibility overcome by X-irradiation of the style.)**
Naturwissenschaften, 1960, **47**: 547, bibl. 4.

If non-pollinated styles of petunia flowers are exposed to X-rays (optimum about 2,000 r) and the stigmas are fertilized immediately afterwards with pollen from the same plant, normal fruits and seeds are obtained from approximately half the treated flowers. It is suggested that self-incompatibility is overcome by irradiation of the style causing biochemical changes in the cellular immunity mechanism.—Bot. Lab. Univ. Nijmegen.

2913. Harper, J. L., and McNaughton, I. H.
The inheritance of dormancy in inter- and intraspecific hybrids of *Papaver*.
Heredity, 1960, **15**: 315-20, bibl. 9.

Hybrids between several *Papaver* spp., including *P. rhoeas* (Shirley), commonly lacked the seed dormancy shown by the parent species.

2914. Kanta, K.
Intra-ovarian pollination in *Papaver rhoeas* L.
Nature, 1960, **188**: 683-4, bibl. 3, illus.

The technique of injecting a suspension of pollen grains into the ovarian cavity by syringe is described. Normal, viable seeds were obtained. The method may be used to overcome certain types of incompatibility.—Univ. Delhi.

2915. Crawford, R. M. M.
Effect of temperature fluctuations on flowering in *Salvia splendens*.
Nature, 1961, **189**: 75-6, bibl. 3.

In the phytotron at the University of Liège salvias were grown at a constant 20° or 27° C. night and day and also in long days at 20° C. by day and

27° C. by night and vice versa. There was little lifference in the time taken for the plants to flower or in their heights at flowering time, when the emperature was kept constant at either 20° or 27° C. lay and night. Under the varying temperature egimes, however, flowering was much retarded. Moreover, the effects of temperature alternation vere not related to the periods of light and darkness.

2916. Sutton, P. J.
Preliminary experiments in the use of loamless composts for the propagation of antirrhinums and tomatoes.
A.R. Glasshouse Crops Res. Inst. 1959, 1960, pp. 89-98, bibl. 4.

The germination and growth of antirrhinum and omato plants in peat and sand composts, with ime and base fertilizer additions, were compared with those of plants raised in John Innes composts. Both crops germinated better in the peat and sand composts than in JIS compost. Tomatoes germinated better in 1 : 3 and 1 : 1 sand and peat composts than in a 3 : 1 mixture. Antirrhinums germinated equally well in any of the sand and peat mixtures, but showed some improvement with the addition of more lime. Growth after pricking-out was also satisfactory in the loamless composts, provided that sufficient base fertilizers and liquid feeding were provided.

2917. Hiller, W., and Schellhase, R.
Ergebnisse von Belichtungsversuchen mit Antirrhinum. (**Experimental results obtained in the artificial lighting of snapdragons.**) [Russian and English summaries 9 and 8 lines.]
Arch. Gartenb., 1960, **8**: 432-40, bibl. 5.

In experiments carried out during 1957-59 it was found that the only snapdragon varieties to benefit from supplementary illumination are those that have a short growing period and can be spaced closely (e.g. Helen and Ball's hybrids). The cost of treatment up to the time of transplanting was not more than 0·03 DM per plant. Treated plants were ready for sale a fortnight earlier than the controls and they were of a better quality. There was no advantage in providing artificial lighting for plants sown after 1 January.—Inst. ZierpflBau, Humboldt-Univ., Berlin.

Bulbs, tubers, etc.

(*See also* 1695, 1702, 1807, 1817, 2260, 2874, 2881, 2882, 2884, 2885, 2887, 3572, 3578, 3584, 3595, 3597, 3607, 3611.)

2918. Gould, C. J.
World trends in bulb production.
Flor. Exch., 1960, **135**(19): 14-15, 17, bibl. 13.

With acreage figures for the U.S.A., Canada, England, Japan and Holland.

2919. Lees, P. D.
Bulbs.
A.R. Rosewarne exp. Hort. Stat., 1959, 1960, pp. 18-25.

Nutrition. Potash was again shown to be of importance at Rosewarne for narcissi and tulips, giving a greater number of flowers and an increase in bulb weight over the control. Irises responded better to P than to N or K. In all plots dung plus NPK gave the best results in growth and bulb increase. Top-dressings of sulphate of ammonia were of no benefit to narcissi. *Weed control:* For narcissi the best treatment was a pre-emergence application of PCP at 5 gal./acre, plus CIPC applied after emergence at ½ gal./acre. Reports are given of other trials on pre-planting cultivations, planting and lifting dates and methods, and handling dry bulbs.

2920. Krijgsman, H. K.
Het project werkmethodeverbetering bloembollenbedrijven. (**The project: work study in the bulb industry.**) [English summary ¼ p.]
Meded. Dir. Tuinb., 1960, **23**: 515-24, illus.

Methods used in the sorting and despatch of bulbs were studied with the aim of increasing the workers' output. Eighty bulb farms were visited and detailed studies were made on 6 of them. Among the improvements introduced were the use of portable benches for transport, the replacement of baskets by bags and new tables for bulb cleaning.—I.T.T., Wageningen.

2921. Spoelstra, P. A., and Veerman, J. A.
Nieuwe technische ontwikkeling bij de bewaring van bloembollen. (**New technical developments in bulb storage.**)
Weekbl. BloembollCult., 1960, **71**: 350-1, illus.

An experimental store for bulbs was used with success in one season. Warm air is forced from a central shaft through the floor of each storage compartment on either side of the central shaft. Bulbs can be stored, even in paper bags, with little disease spread, and more bulbs can be satisfactorily stored than in the common type of bulb store.—I.T.T., Wageningen.

2922. Spoelstra, P. A.
Klimaatregeling in de bloembollenscnuur. (**Control of climate in the bulb store.**)
Weekbl. BloembollCult., 1960, **71**: 368-9, illus.

An air heater and humidifier unit described with diagram.

2923. Gill, D. L.
Reducing amaryllis leaf spot by spraying.
Plant Dis. Reptr, 1959, **43**: 1272-3, bibl. 6.

Zineb (2 lb./100 gal.) and ferbam (2 lb./100 gal.) were effective against *Stagonospora curtisii* on amaryllis, when applied 6 times between the small-leaf stage and flowering. Infection was also reduced, though less effectively, by captan and Copper A.—U.S.D.A., and Ga agric. Exp. Stat., Tifton.

2924. Jeff, A. E.
Anemones.
A.R. Rosewarne exp. Hort. Stat., 1959, 1960, pp. 7-17.

Manurial trials: The value of balanced phosphate and potash manuring and of FYM was again apparent; there were certain responses to nitrogenous top-dressings in mid-August, including better leaf colour, longer stems and sometimes higher flower yields. *Time of planting and corm size:* The largest corms (¾ cm.), planted on 29 May, 19 June, 10 and 31 July, gave the highest yields and the earliest peak crop; for cropping between November and January planting on 19 June gave the most continuous cropping. *Disease control:* Soil sterilization with various fumigants before planting was again the most effective treatment for control of downy mildew; corm germination was seriously affected by a pre-planting soak in streptomycin; captan was again the most effective material for controlling the aerial spread of *Botrytis* and *Peronospora*, and the importance of spraying after bad weather in the winter months is emphasized. *Weed control:* Simazine and monuron both controlled weeds, and the highest flower yields were obtained with simazine at ½ lb./acre or monuron at 1 lb./acre. Mulching with black polythene eliminated weeding, but did not affect flower production. *Protection:* Although none of the structures used was economic, the best results were obtained under low glass covers and single-span Dutch lights with polythene sides.

2925. Boerema, G. H., and Silver, C. N.
De *Peronospora* bij anemoon, *Anemone coronaria* L. (**Downy mildew of anemones.**) [English summary ¼ p.]
Meded. PlZiekt. Dienst **134**, 1960, pp. 155-7, bibl. 6.

Downy mildew, caused by *Peronospora* sp., appeared in Dutch glasshouses for the first time in 1957. Chemical sterilization of the soil was not effective, but steam sterilization gave good results.

2926. Lewis, G. J.
The genus *Babiana*.
Suppl. Vol. J. S. Afr. Bot. 3, 1959, pp. 149, bibl. 78, illus.

A systematic study with detailed illustrated descriptions of the species and keys.

2927. Rünger, W.
Über den Einfluss der Temperatur und der Tageslänge auf die Bildung und Entwicklung der Adventivwurzeln und -triebe an Blattstecklingen von Begonia "Konkurrent" und "Marina". (**The effect of temperature and day length on the formation and development of adventitious roots and shoots on leaf cuttings of the begonia varieties Konkurrent and Marina.**) [English and French summaries 11 and 14 lines.]
Gartenbauwiss., 1959, **24**: 472-87, bibl. 11.

For root formation on begonia leaf cuttings 25–30° C. was the best temperature initially, but after 40 days 20–25° C. had a more favourable effect. At 15° C. root formation was slower and at 10° C. it did not occur at all. Adventitious shoots developed best at 15–20° C., especially during the first 20–40 days. A temperature of 30° C. during the first 20 days suppressed shoot formation completely, even if it was followed by more favourable temperatures. In the early developmental stages the rate of growth was highest at 25° C. in the variety Konkurrent and at 20° C. in the variety Marina. At all the temperatures studied (15–30° C.) the shoots formed flowers under short-day conditions and made vegetative growth under long-day conditions. The number of shoots formed and their rate of growth were lower in short-day than in long-day conditions. The effect of long-day treatment during the first 40 days on the number of shoots formed was only apparent if the light intensity remained high during the subsequent period.—Inst. ZierpflBau, tech. Hochsch., Hannover.

2928. Rünger, W.
Temperatureinflüsse auf Adventivtrieb und Adventivwurzelbildung an Blattstecklingen von Lorrainebegonien. (**The effects of temperature on adventitious shoot and root formation in leaf cuttings of Lorraine begonias.**)
Gartenwelt, 1960, **60**: 344-5, bibl. 3.

The temperature recommended for the first 20–30 days after planting the cuttings is 15–20° C. The best adventitious shoot formation from leaf cuttings was obtained in summer, provided the plants were kept cool in a cellar and given artificial illumination. It should be possible to grow saleable pot plants for the December market from cuttings taken in May or even in June.—Inst. ZierpflBau, tech. Hochsch., Hannover.

2929. Semal, J.
Contribution à l'étude des virus du begonia. Étude de quelques isolements effectués à partir de *Begonia tuberhybrida*. **(A contribution to the study of begonia viruses. A study of several isolations from *Begonia tuberhybrida*.)**
Bull. Inst. agron. Gembloux, 1960, **28**: 199-216, bibl. 23, illus.

In Belgium a very high percentage of multiflora begonias are virus-infected, but with a few exceptions viruses are not found among grandiflora types. Thus the production of virus-free multiflora plants by vegetative means will be a lengthy process and multiplication from seed should be considered. Production of virus-free grandiflora types by vegetative means should not be too difficult, but propagation should take place away from virus sources and especially multiflora begonias.

2930. Wilson, J. Y.
Changes in the distribution of chiasmata in response to experimental factors in the bluebell, *Endymion nonscriptus* (L.) Garcke.
Reprint from *Genetica*, 1959, **30**: 417-34, bibl. 13.

2931. Jadhav, A. S.
Canna seeds can be germinated.
Poona agric. Coll. Mag., 1960, **51**: 28-9.

Hard black seeds soaked in sulphuric acid for 3 hours or with the radicle cap removed gave germination percentages of 72 and 82, respectively. Seeds harvested at the brown soft stage gave 89% germination, and with the radicle cap removed 94%. No untreated, hard black seeds germinated.

2932. Silver, C. N.
Bestrijding van roest (*Uromyces croci*) in crocussen. **(Rust control in crocuses.)**
Weekbl. BloembollCult., 1960, **71**: 270.

Rust-infected corms were best treated with organic mercury fungicides. Hot water treatment is recommended for corms infected by eelworms as well as rust.—PlZiekt. Dienst., Wageningen.

2933. Zinsmeister, H. D.
Das phototropische Verhalten der Blütenstiele von *Cyclamen persicum* Hybr. **(The phototropic behaviour of the peduncle of *Cyclamen persicum*.)**
Planta, 1960, **55**: 647-68, bibl. 49, illus.

When young the peduncle bent towards a unilateral light source, but at the fruiting stage the peduncle bent away from it. More growth substance was produced by the fruiting apex than by the flower bud, but this did not account for the difference in behaviour. There was a decrease in permeability to water in the illuminated half of the young peduncle, which did not occur in the fruiting peduncle.—Univ. München.

2934. Fritzsche, R., and Schmidt, H. O.
Das Blühen der Cyclamen unter dem Laube und seine Ursachen. **(The flowering of cyclamen below the foliage and its causes.)**
Dtsch. Gartenb., 1960, **7**: 276-8, bibl. 4, illus.

Irregular watering of cyclamen was followed by abnormal flowering in some plants, with the flowers opening beneath the leaves. This phenomenon was accentuated by high growing temperatures, particularly towards the end of the flowering season.—Inst. Phytopath., Aschersleben.

2935. Bonifacio, A.
Su di un avvizzimento del *Cyclamen persicum*. **(A cyclamen wilt.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 165-71, bibl. 11, illus.

A description is given of the symptoms of a wilt caused by *Pectobacterium carotovorum*. Recommended control measures include the use of sterilized soil, the avoidance of wounds, and, if early symptoms are observed, retarding the development of the pathogen by reducing the temperature and humidity of the greenhouse.—Ist. Pat. for. veg., Univ. Firenze.

2936. Ogg, S.
Cultivation of the dahlia.
J. roy. hort. Soc., 1960, **85**: 486-91, illus.

Propagation from seed, from division of old roots and from cuttings taken in a heated greenhouse is described, together with advice on general culture.

2937. Newton, P.
Dahlia researches.
Gdnrs' Chron., 1960, **148**: 70.

Using several decorative and pompon varieties the relationship between flower production, tuber size and the production of cuttings was studied. The fewer the blooms a plant was allowed to produce and the smaller the individual flowers, the greater was the tuber weight. The effect of the number of blooms on the subsequent production of cuttings by the tuber varied markedly between varieties.—Univ. Manchester.

2938. Forsberg, J. L.
Dahlia diseases.
Ill. St. Flor. Ass. Bull., 1960, No. 209, pp. 5-7, bibl. 13, illus.

Symptoms and control of fungus, bacterial and virus diseases, hopperburn caused by the leafhopper *Empoasca fabae* and storage rots.

2939. Maiskii, F. F.
La sélection et la culture des glaieuls en U.R.S.S. **(The selection and culture of gladiolus in the U.S.S.R.).**
Rev. hort., Paris, 1960, **132**: 2304-5, illus.

Mainly on varieties, with a short note on nutrition.

2940. JENKINS, J. M., JR.

Selected gladiolus varieties and their blooming dates.

Flor. Exch., 1960, **134**(25): 12.

New varieties with their earliest and average flowering dates in North Carolina.

2941. SCHENK, P. K.

De warmwaterbehandeling van kralen, een belangrijk hulpmiddel in de strijd tegen gladiolenziekten. (**Hot water treatment of cormels, an important method of controlling gladiolus diseases.**)

Weekbl. BloembollCult., 1960, **71**: 330-2, illus.

Factors affecting cormel reactions to hot water treatment were studied with the following results: Storage at about 25° C. before treatment was better from the point of view of cormel survival than higher or lower temperatures. 9 January was the best date for hot water treatment, regardless of the date of lifting. Cormels from cormels (variety Dr Fleming) appeared to survive the treatment better than those from corms. There was no difference in the survival of San Souci cormels which had been grown in different soil types. The temperature during 2 days' pre-soaking should be about 20° C. Hot water treatment at 55° C. was only slightly more injurious than treatment at 53° C. Cormel size did not seem to affect survival. After treatment and drying the corms were stored in a frost-free store at a temperature below 10° C. A fungicidal dip before planting improved emergence. Recommendations are also made on the technique of treatment, including the use of large baths (holding 500 l. or more), a circulating pump, and small wire netting containers each holding 10 or 15 l. of cormels. [See also *H.A.*, 30: 2619.]—Lab. BloembollOnderz., Lisse.

2942. AYCOCK, R.

The influence of preplanting treatments of root-knot-infested gladiolus corms and row applications of nematocides on nematode control and production of corms and flowers.

From abstr. in *Phytopathology*, 1960, **50**: 574.

When corms infested with *Meloidogyne incognita acrita* were kept for 4 hr. in 0·5% formalin at 43° C. no nematodes survived. Hot water treatment of the corms for 10 min. at 50° C. did not kill the nematodes but stimulated plant emergence and subsequent vigour. Yields and quality of flowers from infested corms planted in soil treated with 0·5 gal. Nemagon or 2 gal. EN 18,133 per acre in the row equalled those from corms that also received a pre-planting eradicative treatment. The yield of number 1 and jumbo corms was greatest and of highest quality from infested corms treated for 4 hr. in 0·5% formalin at 43° C. and planted in Vapam-treated soil. However, at harvest nematode populations were 3 to 6 times as great in Vapam-treated plots planted with infested corms as when such corms were planted in untreated soil.

2943. KOSUGI, K., AND KONDO, M.

Studies on the propagation of gladioli for export. II. On the effects of planting time and size of cormels upon the corm and cormel production. [Japanese, with English summary $\frac{1}{3}$ p.]

Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 173-6, bibl. 3.

Cormels of 4 varieties were planted in May and August, 1956, and corms of 2 varieties in August, 1956, and March, 1957. Results showed that the germination and flowering percentages, height of plant, cormel and corm production depended on the size of cormel planted in both the autumn and spring plantings, although growth and production were lower in the autumn-planted plots than in the spring-planted plots. It is concluded that satisfactory results could be obtained with autumn planting in warmer regions, provided large cormels were used. [For part I, see *H.A.*, 30: 2617.]

2944. KOSUGI, K., AND KONDO, M.

Studies on blindness in gladiolus. VII. Effect of fertilizer treatment in the previous year on flowering in the current year. [Japanese, with English summary $\frac{1}{2}$ p.]

J. hort. Ass. Japan, 1960, **29**: 163-8, bibl. 8.

Plants of Spotlight flowered earlier when, in the previous year, they had been given 100 p.p.m. N and 25–50 p.p.m. P than when they had been given 200 p.p.m. N alone. Where N had been supplied there were increases in the percentages of germination and flowering, the number of florets, the height of the plants, the fresh weights of the tops and corms and the number of cormels. Applications of 200 p.p.m. N and 50 p.p.m. P are advocated for the year prior to flowering. [For part VI, see *H.A.*, 31: 1117.]

2945. SUMITOMO, A., AND KOSUGI, K.

The effect of herbicides on gladiolus corm and cormel production, with special reference to the time and number of applications and combination of chemicals. [Japanese, with English summary $\frac{1}{4}$ p.]

Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 177-80, bibl. 4.

Successful weed control, with satisfactory corm and cormel production, was obtained by early applications of 2,4-D, SES plus 2,4-D, or SES alone. IPC injured the leaves and did not give effective weed control.

2946. Schenk, P. K.
Hardrot van gladiolen, een gemakkelijk te bestrijden ziekte. (***Septoria gladioli*, a gladiolus disease which is easy to control.**)
Weekbl. BloembollCult., 1960, **71**: 264-5, illus.

For another account, see *H.A.*, 31: 1122.

2947. Simonet, M., and Werckmeister, P.
Ein Colchicin-induzierter amphiploider Sektionsbastard zwischen *Iris hoogiana* Dykes (Sektion *Regelia* Foster et Baker) und *Iris chamaeiris* Bert. (Sektion *Pogoniris* Spach, series *Pumilae* Lawr.) (**A colchicine-induced amphiploid inter-sectional hybrid between *Iris hoogiana* and *I. chamaeiris*.**)
Züchter, 1960, **30**: 190-3, bibl. 14, illus.

The hybrid, with 2 n=84 chromosomes, described.

2948. Gerlach, W.
Über die *Botrytis*-Wurzelstockfäule der *Iris* und ihr Vorkommen in Deutschland. (**Rhizome rot of irises caused by *Botrytis* and its occurrence in Germany.**) [English summary 7 lines.]
NachrBl. dtsch. PflSchDienst., Braunschweig, 1961, **13**: 7-9, bibl. 12, illus.

In 1957 a rhizome rot was found on iris varieties imported from the U.S.A., and the causal fungus was identified as *Botrytis convoluta*. Preventive measures include pre-planting treatment of the rhizomes with mercury compounds or formalin.—Biol. Bundesanst., Inst. Mykol., Berlin-Dahlem.

2949. Schenk, P. K., Neuvel, J., and van der Peet, S. P.
Bestrijding van wortelrot bij irissen. (**The control of iris root rot.**)
Weekbl. BloembollCult., 1960, **71**: 247.

Vapam was the best of several fumigants tested for control of iris root rot [cause not specified]. The recommendation is to use it at 5 l./are, watered over the soil rather than injected.—Lab. BloembollOnderz., Lisse.

2950. Royal Horticultural Society.
The lily year book, 1961, No. 24.
R.H.S., London, 1960, 9 × 5½ in., pp. 116, illus., 12s. 6d. + 1s. 3d. postage, or U.S.A. $2 post free.

This yearbook is not exclusively devoted to lilies. Fritillaries also receive a considerable amount of attention, and there is also an article on hardy scillas. The majority of the articles and notes are concerned with breeding and with growing lilies under various conditions throughout the world. The articles include a discussion on the hardiness of lilies, and an account of growing lilies commercially in soilless culture. Among the notes there are brief reports on seed treatment of *Lilium formosanum* by X-rays to improve flower colour and on leaf damage following the foliar application of a systemic insecticide.

2951. de Graaff, J.
New greenhouse lilies.
Flor. Exch., 1960, **135**(14): 16-17, illus.

A grower relates his experience with cooling potted lily bulbs at 45° F. for 6 weeks before forcing at 60° F. Lily varieties recommended for cut flower sales at the normal flowering time are listed.

2952. Payne, G. O.
Vernalization of lily seeds.
N.Z. Plants Gdns, 1960, **3**: 320-2.

Slow-germinating types of lily are listed, together with methods of vernalization. One method consists of mixing the seeds, dusted with a fungicide, with damp sand and sphagnum moss or vermiculite in glass jars, which are then sealed and kept in a warm place until bulblets appear. These are planted in pots, which are left out during the cold weather, or kept in the jars in a refrigerator for a month before planting out in the open. Polythene bags may be used instead of jars. Another method consists of sowing the seeds in a damp mixture of leaf mould and loam in containers, which are kept in a warm, dark place for 6 weeks and then transferred to a refrigerator or cold place for 1 month. The pots are then placed in a cold frame where germination takes place within a few weeks.

2953. Smith, D., and Langhans, R. W.
Easter lily progress report.
Bull. N.Y. St. Flower Grs, 1960, No. 179, pp. 1-2, 6, illus.

In preliminary trials Easter lily bulbs were started in mid-December and grown at 5 day and 5 night temperatures and 2 photoperiods. The higher temperatures (70° and 80° F.) at night or day reduced the number of days to flowering, but the number of flowers was also reduced. The best night temperature seemed to be 60° F. The photoperiod had only a slight effect on time of flowering, but with an 18-hour photoperiod the stems were twice as tall as those of plants grown in 9-hour photoperiods.

2954. Ueno, K.
An experiment on the earlier lifting of *Lilium speciosum* var. *rubra*. [Japanese, with English summary ½ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 60-4, bibl. 5.

Best quality plants were obtained from bulbs lifted on 10 August; those from bulbs lifted on 30 July also gave good quality plants, provided growing conditions were good, but those from bulbs lifted on 20 July were not of such good quality. The percentage of diseased bulbs was less, the earlier the digging. Bulbs planted at the beginning of December developed better than those planted in January or February.

2955. BALD, J. G., AND SOLBERG, R. A.
Antagonism and synergism among organisms associated with scale tip rot of lilies.
Phytopathology, 1960, **50**: 615-20, bibl. 7, illus.

From scale tip rot lesions on Croft lily bulbs a *Pseudomonas* sp. was isolated. In pathogenicity tests it caused lesions on wound-inoculated bulb scales, and was re-isolated from the lesions. *Cylindrocarpon radicicola* and *Fusarium oxysporum* were also isolated from diseased lily bulbs. Alone they produced very slight effects when wound-inoculated on lily scales. Combined with the scale tip rot bacterium and inoculated on lily scales, *C. radicicola* reduced or sometimes eliminated the lesions, whereas *F. oxysporum* grew in the diseased tissue and extended the lesions. These antagonistic and synergistic effects suggest an explanation for anomalous reactions of diseased bulbs to pesticidal treatments. [Authors' summary.]—Univ. Calif., Los Angeles.

2956. GASIORKIEWICZ, E. C.
Effectiveness of chemical dip treatments on the culture of Croft lilies.
From abstr. in *Phytopathology*, 1960, **50**: 636.

Sixty-one chemical treatments of bulbs consisting of comparative tests in steam-pasteurized and unpasteurized soils were conducted during 1955-59. Beneficial root rot control was obtained from steam treatment of soils plus certain chemical dip treatments. Root rot was not correlated with the soil ball index (i.e. evaluation of the root system when the plant was removed from the pot). None of the treatments affected blooming date, growth or scorch. Mercury compounds delayed or inhibited emergence when used as 30-minute immersion dip treatments. Single-compound treatments failed to control all the root rot organisms. Combinations such as 75% pentachloronitrobenzene used at 1 lb. per 100 gal. plus captan (50 W) at 2 lb. per 100 gal. gave very promising practical results.

2957. WILLIS, W. W., ROGERSON, C. T., AND CARPENTER, W. J.
An evaluation of several fungicides for control of root rot of Croft lilies.
Plant Dis. Reptr, 1959, **43**: 745-9, bibl. 5, illus.

Terraclor, captan and Copper Omadine gave only partial control of soil-borne fungi attacking lily bulbs. Plants were taller and flowered earlier from bulbs dusted with Terraclor or captan by comparison with those grown in soil mixed with the fungicides. Disease-free bulbs, however, flowered several days earlier than dusted bulbs. It is considered that soil-mix treatments were better than bulb dusting for control of the most prevalent fungi, namely *Cylindrocarpon radicicola* and *Fusarium solani*.—Kans. agric. Exp. Stat., Manhattan.

2958. GILL, D. L.
Effects of soaking Easter lily bulbs in Puratized Agricultural Spray or demeton, or in combined soaks, on aphids, black scale and yield.
Plant Dis. Reptr, 1959, **43**: 1274-6, bibl. 4.

Aphids on Easter lilies were controlled by soaking the bulbs in Puratized Agricultural Spray in combination with demeton. Puratized Agricultural Spray soaks also controlled black scale (*Colletotrichum lilii*), but they reduced bulb yields, whether used alone or with demeton.—U.S.D.A. and Ga agric. Exp. Stat., Tifton.

2959. ROYAL HORTICULTURAL SOCIETY.
The daffodil and tulip year book, 1961, No. 26.
R.H.S., London, 1960, 9 × 5½ in., pp. 206, illus., 12s. 6d. + 1s. 3d. postage, or U.S.A. $2 post free.

Daffodil and tulip enthusiasts will welcome the many articles on raising, showing and growing their favourite flowers. The emphasis, naturally, is on new varieties, and the year book includes reports of shows throughout the world. Among the articles on the experiences of breeders there is one on breeding sunproof red and white daffodils. In addition there is a group of articles on pests and diseases, covering *Botrytis* and *Fusarium* on narcissi and nematodes attacking narcissi and tulips.

2960. DENNE, M. P.
Leaf development in *Narcissus pseudonarcissus* L. II. The comparative development of scale and foliage leaves.
Ann. Bot., Lond., 1960, **24**: 32-47, bibl. 12, illus.

The development of the vascular system is described and related to the intercalary growth of the leaf. The scale and foliage leaves appear to originate from similar primordia. Their developments diverge when they are about 1 mm. long; a scale leaf is developed where most cell divisions occur in the sheath, and a foliage leaf is formed where there is a region of more rapid cell division at the base of the blade. [From author's summary. For part I, see *H.A.*, 30: 2631.]—Univ. Coll., London.

2961. v.D. HART, R. M.
Temperatuursinvloeden op bloei en groei. **(The effects of temperature on flowering and growth.)**
Weekbl. BloembollCult., 1960, **71**: 490.

The forcing qualities of 4 tulip varieties were improved by storing the bulbs at 34° C. for 1 week before providing the normal storage temperatures for early forcing. Reducing the temperature to 17° C. or lower during part of the storage period of planting stock of Pax, Pink Trophy and White ail resulted in fewer large sized bulbs (sieve 13) at ifting.—Proefst., Lisse.

2962. Kraaijenga, D. A.
Groeimetingen bij de tulpebol. (**Measurements of tulip bulb growth.**) [English summary 2 pp.]
Meded. LandbHogesch. Wageningen, 1960, 60(8): 1-53, bibl. 38, illus.

Growth measurements of bulbs lifted at weekly intervals during growth showed that the increase in weight of the new bulb and secondary bulblets was positively correlated with temperature until May, and thereafter negatively correlated with temperature. The period of fastest bulb growth occurred from about the second half of April and early May until early or mid-June. Weight increase was positively correlated with the hours of sunshine in late April, or in late April and early May. Negative correlations were found between yield and the temperature in November, between yield and the temperature at the end of February, and between yield and rainfall from October to May. A growth meter was developed and used successfully for measurements on several bulbs and corms and on apples. Measurements of tulips showed that growth was interrupted when transpiration was high. Most of the growth took place at night, and thus bulb growth appeared to be regulated by the length of the period with little or no transpiration at night. The only climatic factor that can be easily controlled during the night is wind, and windbreaks of coniferous trees are recommended to help bulb growth in the spring; the usual small hedges are inadequate.—Lab. BloembollOnderz., Lisse.

2963. Amaki, W., and Hagiya, K.
Studies on fertilizer supply to tulips. I. The effect of varied amounts of three nutrient elements on the growth of plants and the yield of bulbs. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 157-62, bibl. 9.

Ammonium sulphate, calcium superphosphate and potassium sulphate were used as nutrients for large and small bulbs of William Pitt grown in a sandy soil. All 3 nutrients tended to increase the height of the plants, increased N making the leaves a darker green and delaying flowering. Flowering was also delayed by increasing the K, but advanced by increasing the P. Bulb weight and number were mainly influenced by N. The moisture content of the bulbs was raised by an increased supply of N and K but lowered by P. Flower bud differentiation was advanced by N and P, though not by K, and in some cases this advance was correlated with moisture content.

2964. Forsberg, J. L.
Tulip diseases.
Ill. St. Flor. Ass. Bull., 1960, No. 207, pp. 1-4, bibl. 19, illus.

The symptoms and control of fire (*Botrytis tulipae*), anthracnose (*Gloeosporium thumenii* f. *tulipae*), gray bulb rot (*Rhizoctonia tuliparum*), blossom blight (*Phytophthora cactorum*) and breaking (virus).

2965. Valášková, E.
Die Bekämpfung des Tulpenfeuers durch Beizen der Zwiebeln. (**The control of tulip fire by bulb disinfection.**)
Dtsch. Gartenb., 1960, **7**: 305-7.

In laboratory studies several compounds were selected that were fungicidal to *Botrytis tulipae*. In field tests with healthy, non-inoculated bulbs the highest yields were obtained following treatment with thiocarbamates, while with artificially-inoculated bulbs the highest yields were obtained following treatment with certain mercurial compounds. Some of the materials could be applied to the bulbs immediately after lifting and cleaning, but this was not satisfactory with mercurial compounds or silver nitrate. Formalin applied after lifting or before planting, and copper sulphate applied before planting reduced bulb yields by comparison with those of untreated bulbs.—Inst. Cult. ornam. Plants, Pruhonice, Czechoslovakia.

2966. Shibata, M., and Ishikura, N.
Paper chromatographic survey of anthocyanin in tulip-flowers. I.
Jap. J. Bot., 1960, **17**: 230-8, bibl. 18.

Data are included on the flower colours of 107 varieties and the anthocyanidin composition of these colours. At least 6 anthocyanins, as well as various minor pigments, occur in tulip flowers, and most red to dark purple varieties contain 2 to 4 anthocyanins.

2967. van Slogteren, E.
Mislukte tulpen. (**Wilting of [cut] tulips.**)
Publ. Lab. BloembollOnderz., Lisse, **137**, 1959, p. 1, illus.

When put in a vase containing water in which narcissi had been standing.

Lawns and sports turf.

(*See also* 1863, 1865, 3224.)

2968. Reeker, R.
Rasenteppiche. (**Grass carpets.**)
Torfnachrichten, 1960, **11**: 9-10, illus.

A brief account is given of the ingredients and method of making grass carpets, which provide an ideal, quickly established general purpose turf cover for the private garden or other purpose. The size found most suitable is 1 m. × 4 m. and about

1 cm. thick. This rolls up for transport and, depending on its moisture content, will weigh from 10 to 30 kg., which is considerably lighter than a similar strip of ordinary turf. Very briefly a flat impermeable surface is necessary as a base and the mixture used consists of 1 cu.m. of fine loose fertilizer-peat, 3 kg. calcium carbonate, 1·5 kg. general fertilizer, 2 g. sodium molybdate and 15 g. iron chelate. When this has been mixed and prepared the grass seed generally used consists of 50% *Festuca rubra*, 25% *Agrostis alba* and 25% *Poa pratensis*. The actual making of the carpet can be carried out from spring till late autumn.

2969. Montgomery, F. H., and Switzer, C. M.
Weed control in lawns.
Bull. Ont. Dep. Agric. **529**, 1959, pp. 30, illus.

Twenty-six commonly occurring weeds of lawns are illustrated, with notes on their identification and control.—From *Weed Abstr.*, **9**, No. 1209.

2970. Anon.
Weed control in turf.
From abstr. in *Mtg Weed Soc. Amer., 1960*, pp. 48-51.

For results summarized from 8 reports see *Weed Abstr.*, **9**, No. 1411.

2971. Goss, R. L.
The effect of cutting height and nitrogen level on shoot and root production in turfgrasses.
Diss. Abstr., 1960, **21**: 410, being *L.C. Card No. Mic.* 60-2703 of 87 pp.

Among 8 bluegrass, 1 bentgrass and 1 fescue varieties there were significant differences in shoot yields in 1957, but not in 1958. High cutting (to 1 inch) produced more shoots in 1957, but low cutting (to ½ inch) produced more shoots in 1958. Nitrogen was applied in 4 equal monthly applications at 2 rates, viz. 8 lb./1,000 sq. ft. and 2½ lb./1,000 sq. ft. per season. There was a significant interaction between cutting height and N level on shoot production in 1957, but not in 1958. Average tissue contents of N were higher from the low-cutting treatment and from the high N treatment, but the highest percentage of N recovered was from the low N treatment. Seven of the bluegrass varieties produced more root than the bent and fescue. High cutting resulted in a greater root yield. The low N treatment produced significantly more roots in both seasons. Shoot : root ratios were always narrower with low N. The high cutting treatment produced a narrower shoot : root ratio than low cutting, although the difference was small. —Wash. St. Univ.

2972. (Duich, J. M.)
Ureaform nitrogen suggested for full season turf growth.
Science for the Farmer, 1960, **8**(1): 15.

Ureaformaldehyde gave the slowest rates of growth but grew grass for the greatest length of time in trials in Pennsylvania covering 7 years.

2973. Bloom, J. R., and Couch, H. B.
Influence of environment on diseases of turfgrasses. I. Effect of nutrition, pH, and soil moisture on *Rhizoctonia* brown patch.
Phytopathology, 1960, **50**: 532-5, bibl. 15.

Under experimental conditions attacks of the disease caused by *Rhizoctonia solani* in plants of seaside bentgrass (*Agrostis palustris*) were most severe at high N levels and decreased with decreasing N levels. Varying the levels of K and P did not influence the disease. However, the disease was greater at a low level of balanced nutrition than at a normal level. At low N levels altering the pH did not influence the disease reaction, but at higher levels the disease intensity was significantly greater at pH 5·6 and 9·0 than at pH 4·0. With normal nutrition the disease was least severe at pH 8·5 and 10·0. No differences in the development of the disease were found as a result of using 5 soil moisture levels ranging from field capacity to the permanent wilting percentage.—Pa St. Univ., University Park.

2974. Couch, H. B., and Bloom, J. R.
Influence of environment on diseases of turfgrasses. II. Influence of nutrition, pH and soil moisture on *Sclerotinia* dollar spot.
Phytopathology, 1960, **50**: 761-3, bibl. 9.

Kentucky bluegrass (*Poa pratensis*) was grown at various levels of nutrition and inoculated with *Sclerotinia homoeocarpa*. Under low N nutrition, with normal levels of P and K, or under low balanced nutrition, disease severity decreased significantly. Disease development was not influenced by high or low levels of P and K or by high N or high balanced nutrition. Altering the pH from 4 to 9 at different nutritional levels did not affect disease proneness. Disease development was significantly greater with irrigation practices that produced higher soil moisture stresses, i.e. allowing the plants to extract ¾ field capacity and below. [From authors' summary.]—Pa St. Univ., University Park.

2975. Chada, H. L., and Wood, E. A., Jr.
Biology and control of the rhodesgrass scale.
Tech. Bull. U.S. Dep. Agric. **1221**, 1960, pp. 21, bibl. 23, illus.

The scale insect (*Antonina graminis*) and its life history and host plants are described. Biological control with *Anagyrus antoninae* is effective under conditions of high humidity, but has proved ineffective in the United States. Systemic insecticides such as demeton and schradan, at 3·6 g./½ gal. water/sq. yd. applied as a soil drench, gave the best control on lawns and golf greens.

Foliage and succulent plants.

(*See also* 1738, 3336.)

2976. Munnecke, D. E.
Bacterial stem rot of dieffenbachia.
Phytopathology, 1960, **50**: 696-700, bibl. 9, illus.

The symptoms were wilting of the lower leaves followed by darkening and water soaking and rotting of the stem at soil level. The pathogen was allied but not identical to *Erwinia chrysanthemi*. The host range was determined. Partial control may be obtained by dipping cuttings in Agri-mycin 100 and propagating them in a disinfected greenhouse. Remaining bacteria may be eradicated by treating sections of stems 1·0–1·5 in. in diameter for 30–60 minutes in water held at 120° F. before using them as cuttings.—Univ. Calif., Los Angeles.

2977. Stein, D. B., and Stein, O. L.
The growth of the stem tip of kalanchoë cv. "Brilliant Star".
Amer. J. Bot., 1960, **47**: 132-40, bibl. 22, illus.

A histological and developmental study.

2978. Lange, O. L., and Schwemmle, B.
Untersuchungen zur Hitzeresistenz vegetativer und blühender Pflanzen von *Kalanchoë blossfeldiana*. (**Studies on the heat resistance of vegetative and flowering plants of *Kalanchoe blossfeldiana*.**)
Planta, 1960, **55**: 208-25, bibl. 34.

Leaves were severely damaged when heated for 30 minutes at 47° C. on plants in the vegetative phase, and at 50° on those in the flowering phase. After 10 days of short-day treatment, which had a scarcely noticeable effect on leaf succulence, there was a definite increase in heat resistance. Thereafter there were parallel increases in heat resistance and in leaf succulence. At least during the first induction period, therefore, increase in heat resistance and increase in succulence are independent processes. The period of greatest temperature sensitivity occurs when the young leaves are still actively growing. This period coincides with the beginning of the rise in photoperiodic sensitivity. —Univ. Göttingen.

2979. Sanwal, G. G., and Krishnan, P. S.
Diurnal variation in aldolase and phosphatase activity in the cactus plant.
Nature, 1960, **188**: 664-5, bibl. 5.

In *Nopalea dejecta* adolase specific activity was at a minimum at 4 p.m. and increased to a maximum at 4 a.m., whereas variations in phosphatase activity were less and occurred in the reverse direction.—Lucknow Univ.

2980. Carlson, G.
Sansevieria could become the modern aspidistra.
Comm. Gr, 1960, No. 3384, pp. 1033-5, illus.

Some varieties and their culture.

Orchids.

(*See also* 1889, 2888.)

2981. Gopalkrishna, N., and Bhore, D. P.
The orchids of Bombay.
Poona agric. Coll. Mag., 1960, **51**: 55-66, bibl. 15.

The distribution, flowering times and fruiting periods of 158 species are tabulated.

2982. da Silva Netto, A. F.
Orchidaceae cultivadas em Viçosa. (**Orchids cultivated in Viçosa.**)
Rev. Ceres, 1960, **11**: 92-5, bibl. 6.

A list of 84 species from the botanic garden of the College of Agriculture, Viçosa, Minas Gerais, Brazil.

2983. Quyn, B. St. H.
The culture of *Phalaenopsis* in Ceylon.
Trop. Agriculturist, 1959, **115**: 257-81, bibl. 16, illus.

Humidity should be about 70% and the temperature between 65° and 90° F. Corrugated acrylic plastic provides the correct degree of shading. Housing is necessary to protect the plants from rain. Tree fern root from *Alsophila crinita* makes an ideal mounting medium, which should be soaked once a month with a balanced inorganic fertilizer mixture. Offsets, root proliferation and proliferation of the peduncle provide plantlets for vegetative propagation. Pests and diseases are described with suitable control measures.—Roy. bot. Gdns, Peradeniya.

2984. Oertli, J. J., and Kohl, H. C., Jr.
Der Einfluss der Bestäubung auf die Stoffbewegung in Cymbidiumblüten. (**The effect of pollination on the translocation of matter in *Cymbidium* flowers.**) [English and French summaries 9 and 12 lines.]
Gartenbauwiss., 1960, **25**: 107-14, bibl. 6.

Pollination of cymbidium flowers causes an increase in dry weight of column and ovary and a decrease in sepals, petals and labellum. The relative water content of column and ovary increases and of sepals and petals decreases. P^{32}-labelled phosphate is accumulated in column and ovary. This effect is greatly enhanced after pollination, while actually a smaller amount moves into sepals and petals. In a cymbidium flower pollination induces a movement of previously absorbed P^{32}, of water and of other substances from sepals and petals into column and ovary. Pollinated flowers seem to take up more water. Most of this water is retained in the flower and the actual amount transpired may even be decreased. [Authors' summary.]—Univ. Calif., Los Angeles.

2985. Pérez, J. E., and Cortés-Monllor, A.
Survey for the presence of tobacco mosaic, cymbidium mosaic, and other viruses in orchids. [Spanish summary ½ p.]
J. Agric. Univ. P.R., 1960, **44**: 138-49, bibl. 12, illus.

Serological examination of 205 samples from 13 nurseries revealed TMV associated with CMV in variegated *Cattleya* flowers and in the leaves of *Cattleya*, *Epidendrum* and *Calanthe* spp. The unreliability of visual observation for virus diagnosis in orchid leaves is emphasized.

Roses.

(*See also* 1817, 2416, 2888, 3005, 3013.)

2986. Anon.
Test highway hedge.
Amer. Nurserym., 1960, **112**(11): 47.

The efficiency of a hedge of *Rosa multiflora japonica* planted on the dividing strip of a highway, was tested by driving a car into it at various angles and speeds. It was concluded that a close planted double hedge could stop a car travelling at normal speeds.

2987. Kamp, J. R., and Shannon, J. C.
The effects of low soil potassium, high soil calcium, and air cooling on roses grown in a high boron soil.
Ill. St. Flor. Ass. Bull., 1960, No. 208, pp. 2-6, bibl. 4, illus.

Better Times roses were grown in cooled and uncooled greenhouses in a soil high in B, and were supplied with different levels of K, Ca and P. Where levels of 12 p.p.m. of P and of 4 and 8 p.p.m. of K were maintained, growth was better than where lower levels of P and K were maintained. Low K levels produced symptoms known as blue bud. Ca, supplied at 3 levels, had no effect. Better flower production was consistently obtained in the uncooled house than in the cooled house [see also *H.A.*, 29: 2790].

2988. Munnecke, D. E.
Hairy root of field roses.
From abstr. in *Phytopathology*, 1960, **50**: 647-8.

The bacterium associated with hairy root in roses is intermediate in pathogenicity between *Agrobacterium tumefaciens* and *A. rhizogenes*. It may occur concurrently with *A. tumefaciens* and the nematode *Pratylenchus penetrans*. Commercial control was obtained by dipping wood for cuttings in 0·5% calcium hypochlorite for 15 min., observing strict sanitary precautions in preparing and storing cuttings and planting on land that had not been planted to roses or crops susceptible to *A. tumefaciens* for at least 2 years. Ethylene dibromide soil treatment controlled nematodes and enhanced hairy root control. [See also *H.A.*, 30: 747.]

2989. Palmer, J. G., and Semeniuk, P.
Relative susceptibilities to blackspot of some rose varieties in excised leaflet assay during 1959.
From abstr. in *Phytopathology*, 1960, **50**: 572.

The floribunda varieties Goldilocks and Chic were very resistant and were followed, in decreasing order of resistance, by the hybrid tea Georg Arends, the hybrid perpetual Black Prince and the hybrid teas Peace and Red Radiance.

2990. Jorgenson, G., and Jorgenson, N.
Black spot disease. Do roses possess inherent resistance?
Amer. Rose Mag., reprinted in *N.Z. Gdnr*, 1960, **16**: 763-71.

Bacteria-free extracts of macerated leaves and stems of infected roses and of leaves and stems of resistant varieties caused inexplicable degenerative changes in cultures of *Diplocarpon rosae*. The extracts when applied to susceptible varieties conferred considerable resistance to the pathogen for a short period of time.

2991. Travis, R. V., and Henneberry, T. J.
Fungicide-acaricide combinations for the control of *Diplocarpon rosae*.
From abstr. in *Phytopathology*, 1960, **50**: 573.

The fungicides 70% maneb, 76% ferbam, 65% zineb and 50% captan were combined with the acaricides 15% Aramite, 25% malathion, 26·2% demeton and 47·5% Thimet to test their efficiency for the control of *Diplocarpon rosae* and *Tetranychus telarius* on inoculated Helen Traubel roses. Analysis of the black spot and mite ratings showed maneb and zineb to be the best fungicides and Aramite and demeton the best acaricides.

2992. Lyle, E. W.
Black spot yields to new sprays for roses.
Amer. Nurserym., 1960, **112**(10): 10, 100-2.

Spray programmes involving weekly applications of maneb, phaltan and Cyprex were successful in controlling black spot of roses. Bushes sprayed with one or other of these materials weighed 73–98% more than control bushes, which received no fungicidal treatment after 3 June.—Texas Rose Res. Foundation, Tyler.

2993. Powell, K. M.
Controlling black spot on roses.
Gdnrs' Chron., 1960, **148**: 408, illus.

Symptoms and control of *Diplocarpon rosae* by sanitation and spraying with captan; symptoms of the leaf spot caused by *Sphaceloma rosarum* are also described.

2994. ROSEN, H. R.
Preliminary report on the systemic activity of captan when applied to the soil for the control of black spot of roses.
Plant Dis. Reptr, 1959, **43**: 1176-7, bibl. 2, illus.

Soil applications of captan (5 lb. 50% w.p. per 25 q. ft.) were more effective than foliar sprays of various fungicides for control of black spot, and new growth after captan application showed no nfection. There was, however, no control of powdery mildew (*Sphaerotheca pannosa*) or anthracnose (*Elsinoë rosarum*) on captan-treated bushes. For another account, see *H.A.*, 30: 4243.]—Univ. Arkans., Fayetteville.

2995. PALMER, J. G., SEMENIUK, P., AND HENNEBERRY, T. J.
Effects of phaltan and cycloheximide applied separately and in combination upon powdery mildew and plants of blackspot-resistant *Rosa wichuriana*.
From abstr. in *Phytopathology*, 1960, **50**: 572-3.

Both phaltan and Actidione markedly reduced the mildew, but they also reduced growth of the plants, growth decreasing in the order of Actidione, phaltan and Actidione plus phaltan. Actidione stimulated axillary bud initiation, but when combined with phaltan it depressed axillary growth.

2996. (KEMP, W. G.)
New spray deepens rose foliage, kills mildew.
Flor. Exch., 1960, **135**(18): 10.

A brief note to the effect that polybutenes sprayed on rose foliage not only enhance the green colour, but control mildew and discourage mites.

2997. WILLIAMSON, C. E., AND HARRISON, M. B.
Nematode control on roses with root dip treatments.
From abstr. in *Phytopathology*, 1960, **50**: 659.

Low populations of parasitic nematodes, frequently carried on the roots of dormant rose plants bought by commercial growers, are sufficient to re-infest steamed or fumigated soil. Two root dip experiments were conducted using 5- and 7-year-old nematode-infected rose plants, variety Better Times budded on *manetti* understock, discarded from commercial greenhouses. Excellent control of *Pratylenchus* and *Criconemoides* was obtained with a 10-minute soak in a 1% Nemagon or a 0·125% 18,133 E.C. (*O*,*O*-diethyl-0,2-pyrazinyl phosphorothioate) solution or with a 30-minute soak in a 0·1% phorate (*O*,*O*-diethyl-*S*-(ethylthiomethyl) phosphorodithioate) solution.

2998. WILLIAMSON, C. E.
Can we cure nematode infected plants?
Bull. N.Y. St. Flower Grs, 1960, No. 179, pp. 1, 3, 5.

Nemagon, Fumazone (also a form of Nemagon) and V-C 13 effectively reduced nematode populations when applied as soil drenches after planting roses. Visible differences in plant height and general growth showed that both materials were to some extent phytotoxic. Root dips before planting with Nemagon 1%, 18,133 E.C. 0·125% and Thimet 0·1% gave excellent control of *Pratylenchus*, but three rose varieties on *manetti* stocks showed differences in tolerance to the nematicides.

2999. BATRA, H. N., VENKATRAMAN, T. V., AND KUMAR, K.
First record of digger wasp (*Crabro* sp.) burrowing into the pith of cultivated rose plants.
Curr. Sci., 1960, **29**: 355-6, bibl. 2, illus.

The entry of wasps and secondary die-back infection (*Diplodia* sp.) was prevented by painting the cut ends of pruned branches with a mixture of copper carbonate, red lead, linseed oil, 0·1% DDT and 0·1% BHC.—I.A.R.I., New Delhi.

Other trees and shrubs.

(*See also* 1702, 1763, 1790, 1981, 2287, 2445, 2874, 2885, 2887, 3134, 3547, 3559, 3562, 3609, 3611.)

3000. BOOM, B. K.
Benaming, geschiedenis en kenmerken van een aantal houtachtige planten. II. (**Nomenclature, history and characteristics of some woody plants. II.**) [English summaries.]
Reprinted from *Jaarb. ned. dendrol. Ver. 1956, 1957 and 1958*, 1959, **21**: 85-182, illus., as *Meded. Inst. Vered. Tuinbouwgew.* **157**.

Further detailed descriptions of cultivars of ornamental woody plants which are of importance to nurserymen in the Netherlands, and which are not mentioned by Rehder in his "Bibliography of cultivated trees and shrubs". [For part I, see *H.A.*, 27: 3788.]

3001. GILBERT, R.
Les arbres d'ornement à feuilles caduques. Utilisation. Plantation. (**Ornamental deciduous trees: their uses and planting.**)
Publ. Minist. Agric. Québec **245**, [undated], pp. 14, illus.

Includes information on planting, pruning, manuring and a list of species suitable for Quebec province.

3002. GILBERT, R.
Les arbustes. Utilisation, plantation, fertilisation. (**Shrubs: their uses, planting and manuring.**)
Publ. Minist. Agric. Québec **244**, [undated], pp. 10, illus.

For ornamental purposes in Quebec province.

3003. Boddy, F. A.
Highway trees. Parts 4 and 5.
Park Administ., 1960, **25**: 154-5, 288, 291.

Notes on the larger trees and on selecting sites. [Earlier parts were noted in *H.A.*, 30: 5907.]

3004. Baird, W. P.
Ornamental hedges for the northern Great Plains.
Fmrs' Bull. U.S. Dep. Agric. **2105**, revised 1959, pp. 34, illus.

The establishment and maintenance of suitable species.

3005. Royal New Zealand Institute of Horticulture (Challenger, S.).
Proceedings of the Conference on Ornamental Trees and Shrubs for the Garden, Christchurch, 1960, pp. 56.

The Proceedings consist of a series of lectures and discussions, in which advice was given to home gardeners in the Christchurch area on: landscape design; suitable small trees, roses and rhododendrons; trees, shrubs and climbers for winter effect, for walls and for sandy soils; and native tree and shrubs species.

3006. Papp, J.
Weniger bekannte Gehölzsammlungen in Ungarn. (**On some little known arboretums in Hungary.**)
Dtsch. Baumsch., 1960, **12**: 193-202, illus.

Short notes on many arboretums arranged in alphabetical order.

3007. Fordham, A. J.
Propagation of woody plants by seed.
Arnoldia, 1960, **20**: 33-40, illus.

The germination behaviour of woody plants, mostly ornamentals, and methods of breaking dormancy are discussed.

3008. Challenger, S.
Horticulture in Canterbury. Plant propagation studies.
N.Z. Gdnr, 1960, **17**: 25-6.

Some results obtained at Lincoln College are summarized. With 16 species and varieties of conifers the average strike of cuttings with a heel was 52·2%, and with no heel 60%. In trials with *Pittosporum eugenoides* var. *variegata* a 70% strike was obtained with unwounded cuttings, and 100% strike with wounded cuttings. A 10% strike was obtained with unwounded cuttings of *P. tenuifolium* var. Garnettii, but after wounding and IBA treatment the strike was increased to 33%. Old sawdust and ⅛-in. grit seemed a promising rooting medium for cuttings, and was preferred by *Micromyrtus ciliatus* to a peat/sand mixture. The hardening-off of cuttings after propagation under mist was best accomplished when the cuttings were rooted in boxes, rather than being transplanted from the propagating bed. Cuttings of *Hamamelis mollis* taken in early November did not root at all, but those taken on 4 April gave 87·5% strike. Rooting of magnolias varied with the species, *M. stellata* showing 28% strike, *M. soulangeana* var. Lennei 70% strike (after IBA treatment) and *M. liliflora* 90% strike.

3009. Cornuz, L.-A.
Brouillard artificiel et influence du substratum sur les boutures feuillées d'arbustes. (**Mist propagation and the influence of the substratum on leafy cuttings of shrubs.**)
Rev. hort. suisse, 1960, **33**: 344-8, illus.

Tables show the most favourable rooting medium (terralite, sand, peat or a mixture of sand and peat) for over 30 species of shrubs.

3010. Helfert, H.
Die Sommervermehrung von Gehölzen und der Multitopf. (**Summer propagation of shrubs and the "Multipot".**)
Dtsch. Baumsch., 1960, **12**: 217-20, illus.

The advantages of using Multipots [see *H.A.*, 30: 1576] for rooting summer cuttings in the glasshouse or frame are discussed. Suitable pot sizes for various species and also potting composts are discussed.

3011. E.—, L.
Die neue Methode des Einballierens: Polynet in Beutelform. (**The new method of balling in "Poly-net" bags.**)
Dtsch. Baumsch., 1960, **12**: 264-6, illus.

Net bags of plastic are available in 6 sizes for packing balled shrubs. The balls may also be enclosed in aluminium foil to prevent drying out on longer journeys.

3012. Cole, H., Jr., Stambaugh, W. J., and Bauer, A. H.
Tree and shrub nursery seedbed disease control.
Circ. Pa St. Univ. agric. Ext. Serv. **496**, 1960, pp. 11, illus.

The control of damping-off by soil sterilization and by seed and seedling treatment, and, more briefly, the control of seedling leaf diseases and nematodes.

3013. Jenkins, L., and Guengerich, H. W.
Chemical dips for the control of nematodes on bare root nursery stock.
Plant Dis. Reptr, 1959, **43**: 1095-7, bibl. 1.

In small-scale trials with several nematicides used as 5- or 15-minute dips against *Meloidogyne* spp. the most promising results were obtained with 50% American Cyanamid 18133 at 2¼ to 4½ oz./15 gal. and with 1% hydrogenated fish oil. Both compounds, however, killed some of the plants. The test plants were Talisman rose, *Weigela hybrida* var. Eva Bathke, fire thorn [*Pyracantha* sp.] and mazzard cherry trees.—Mo. agric. Exp. Stat., Columbia.

3014. Wood, A. D. B.
Transplanting large trees.
J. Inst. Landsc. Archit., 1960, No. 51, pp. 7-10, bibl. 5, illus., and No. 52, pp. 8-9, bibl. 8, illus.

Methods of moving mature trees, that have proved successful in Britain, are described. Three lists are given, in which certain tree species are classified according to the risk accompanying transplanting.

3015. Scott, H. E.
Lace bugs and their control.
Ext. Folder N.C. agric. Ext. Serv. **177**, 1960, pp. 4.

Azalea, hawthorn, rhododendron and sycamore lace bugs controlled with malathion.

3016. Runge, G. F., Jr.
Taxus weevil threatens yews and rhododendrons.
Amer. Nurserym., 1960, **112**(12): 15, 84-5, illus.

Brachyrhinus sulcatus may be controlled by chlorinated hydrocarbons applied either as sprays on the plants when the adults begin feeding or as granular formulations mixed into infested soil.

3017. Wyman, D.
Majestic beech requires space to display beauty.
Amer. Nurserym., 1961, **113**(1): 16-17, 112-13, illus.

Selected species and sub-species with brief descriptions, together with a list of those not recommended.

3018. Irwin, H. S., and Turner, B. L.
Chromosomal relationships and taxonomic considerations in the genus *Cassia*.
Amer. J. Bot., 1960, **47**: 309-18, bibl. 25.

A comprehensive survey, the results of which tend to confirm the soundness of Bentham's revision.

3019. Zummo, N.
Studies on chemical control of petal blight of camellia incited by *Sclerotinia camelliae*.
Diss. Abstr., 1960, **21**: 421-2, being *L.C. Card No. Mic.* 60-2987 of 79 pp.

Terraclor applied twice at 200 lb. per acre to the soil beneath camellia plants completely suppressed apothecial formation for one flowering season. At 600 lb. per acre Terraclor was effective for 2 flowering seasons. A single application of 50 lb. captan plus 50 lb. Terraclor per acre also suppressed apothecial formation for one season. Terraclor is toxic to *Magnolia fuscata*, causing defoliation, whether applied to the soil or foliage. Systemic fungicides were not successful in controlling petal blight.—La St. Univ.

3020. Overland, L.
Endogenous rhythm in opening and odor of flowers of *Cestrum nocturnum*.
Amer. J. Bot., 1960, **47**: 378-82, bibl. 6.

In nature the strong scent of *Cestrum nocturnum* is produced at night. The cyclic rhythm was found to persist in both constant light and constant darkness at a constant temperature. Changes in temperature lengthened or shortened the cycle but did not destroy it. The controlling mechanism for scent production seems to be located in the tips of the corolla, and the cycle was found to exist independently in the excised tips. [From author's abstract.]—Mo. bot. Gdn, St. Louis.

3021. Lunnum, K., Sander, G. H., and Burlison, V.
Raising Christmas trees for profit.
Ext. Publ. Pacific Northw. Co-op. **6**, revised 1960, pp. 22, illus.

The most widely-grown species is *Pseudotsuga menziesii*, but species of *Abies*, *Picea* and *Pinus* are also grown. All aspects of their culture are discussed.

3022. White, D. P.
Fertilizers for Christmas trees.
Ext. Folder Mich. St. Univ. **F-291**, 1960, pp. 6.

On poorer sites fertilization is recommended for spruce, Douglas fir, true firs and white and red pines. For small established trees 4 oz. of balanced fertilizer per tree should be applied and for older trees up to 1 lb.

3023. Wyman, D.
Widely recognized as most graceful of conifers, hemlock species few.
Amer. Nurserym., 1960, **112**(11): 12-13, 48-9, illus.

Recommended species of *Tsuga* and *Pseudotsuga*, with a classification of hardiness; species not recommended are also listed.

3024. Köster, P.
Wird das "Omorika-Sterben" durch Magnesiummangel verursacht? **(Is magnesium deficiency the cause of *Picea omorika* dying?)**
Dtsch. Baumsch., 1960, **12**: 247-51, bibl. 4, illus.

Dying out of *Picea omorika* has become a serious problem in the nurseries and private gardens of north-western Germany. The symptoms, which are described, suggested a deficiency of available magnesium, and in manurial experiments this hypothesis was largely confirmed. The application of Mg is recommended, although it is emphasized that a deficiency of this nutrient is not necessarily the whole story. The study is being continued.—Lab. Erdbereit., Hamburg-Blankenese.

3025. Miller, W. E., and Arend, J. L.
European pine shoot moth damage reduced on sheared Christmas trees.
Tech. Notes Lake Sts For. Exp. Stat. **592**, 1960, pp. 2, bibl. 1.

Damage to red and Scots pines by *Rhyacionia buoliana* was greatly reduced by clipping the new shoots in mid-July or August rather than in late June. Less than 3–4% of the bud clusters developing on these shoots were destroyed by the shoot moth.

3026. Warren, L. O.
Controlling bagworms on ornamental plantings.
Arkans. Fm Res., 1960, **9**(5): 7.

In trials on evergreens heavily infested with *Thyridopteryx ephemeraeformis*, including junipers, arbor-vitae and cedars, effective control was obtained with malathion SF-60 or 57% e.c. ($\frac{1}{2}$ oz./gal.). No phytotoxic effects were observed at these dosages, but Dimethoate caused severe burn on pines when used at rates higher than 4 lb./100 gal.

3027. Wyman, D.
Cotoneasters useful for varied shrub forms and ornamental fruits.
Amer. Nurserym., 1960, **112**(5): 12-13, 50-6, illus.

Notes on numerous desirable species and a list of species that are not recommended.

3028. Sachs, R. M., and Bretz, C. F.
Control of flowering in fuchsia.
J. roy. hort. Soc., 1960, **85**: 491-3, illus.

Treatment of fuchsias with a 4-hour light break from 10 p.m. to 2 a.m. during the winter produced full bloom in varieties which would normally be vegetative at this time. Buds were visible within 20 days of the start of treatment and full bloom was reached within 40–50 days. A minimum temperature of 60° F. was necessary.—Univ. Calif., Los Angeles.

3029. Major, R. T., Marchini, P., and Sproston, T.
Isolation from *Ginkgo biloba* L. of an inhibitor of fungus growth.
J. biol. Chem., 1960, **235**: 3298-9, bibl. 14.

α-Hexenal present in the leaves at about 75 p.p.m., which may explain the natural resistance of the ginkgo to diseases.

3030. Endo, R. M.
A virus disease of *Hibbertia scandens*.
From abstr. in *Phytopathology*, 1960, **50**: 634.

Growth was optimum at 68° and 74° F. At average day and night temperatures of 88° and 60° F. mosaic virus leaf symptoms and stunting were mild, and at 98° and 60° F. leaf symptoms were absent or very mild. At both temperature combinations the rapidly growing shoots were frequently symptom free, and cuttings from these were often free of virus.

3031. Shanmugavelu, K. G.
A note on the responses of rooting of cuttings of the *Hibiscus rosasinensis* Linn. and *Allamanda cathartica* Linn. to the application of plant growth regulators.
Sci. and Cult., 1960, **26**: 136-7, illus.

Stem cuttings of *A. cathartica* gave 55% rooting when treated with 100 p.p.m. IAA solution or 10,000 p.p.m. IAA dust and 30% rooting when treated with 100 p.p.m. IBA solution, whereas the controls did not root. With softwood cuttings of *H. rosa-sinensis* the best rooting percentages were 70 with a 25 p.p.m. IBA soak and a 2,000 p.p.m. IBA quick dip and 75 with a 1,000 p.p.m. NAA dust treatment.—Annamalai Univ.

3032. Shanmugavelu, K. G.
Induction of roots in the cuttings of *Hibiscus rosasinensis* with plant growth regulators.
Madras agric. J., 1960, **47**: 221-3, bibl. 2, illus.

Dipping semi-hardwood cuttings for 5 seconds into a solution containing 6,000 p.p.m. of IBA or NAA gave over 90% rooting compared with 10% in untreated cuttings. Soaking and dust treatments gave intermediate results.—Annamalai Univ.

3033. Wyman, D.
Interest in hollies adds to list of varieties grown in nurseries.
Amer. Nurserym., 1960, **112**(9): 12-13, 116-24, illus.

A descriptive classification of the many *Ilex* species and varieties which can be grown in the U.S.A.

3034. Wyman, D.
***Ilex crenata* and its varieties.**
Arnoldia, 1960, **20**: 41-6, illus.

Notes on the characteristics of some older varieties, with a list of newer ones.

3035. Furuta, T.
Site preparation and container type. Effects on growth of round-leaved Japanese holly.
Amer. Nurserym., 1960, **112**(9): 15-16, 127-9, bibl. 3, illus.

In these studies crushed road slag (gravel) was the best of the materials tested as a 4-in. base for plants grown in various metal and plastic containers. Minimum air temperatures during the winter, measured at 12 in. above the base layer, were significantly lower above bases composed of sawdust and asphalt than above the road slag or a concrete base. The minimum air temperature in the summer was highest above asphalt. Soil temperatures in the containers were related to root density, colour of the container and position of the container. Plants were regularly clipped during growth, and at the end of the experiment those in ight-coloured containers were more compact than hose in dark containers. It was concluded that oth plastic and metal were suitable materials for containers, and that light colours are to be preferred as giving cooler conditions for plant growth. —Ala. Polytechnic Inst.

3036. Herridge, E. A.
Anatomy and pathology of leaf spots on English holly, *Ilex aquifolium* (Tourn.) L.
Diss. Abstr., 1960, **21**: 416-17, being *L.C. Card No. Mic.* 60-3341 of 95 pp.

Morphological and anatomical studies have shown that it is possible to distinguish between 4 types of spotting observed on holly leaves. Tissue damage of fungal, chemical, mechanical and insect origin is described. [See also *H.A.*, 30: 4270.]—Ore. St. Coll.

3037. Krüssmann, G.
Die Gattung *Hedera* und ihre wichtigeren Gartenformen. **(The genus *Hedera* and its more important horticultural forms.)**
Dtsch. Baumsch., 1960, **12**: 279-90, illus.

Descriptions and illustrations of many ivies, with two identification keys.

3038. Robbins, J. W.
Further observations on juvenile and adult *Hedera*.
Amer. J. Bot., 1960, **47**: 485-91, bibl. 14, illus.

An arborescent form of *Hedera canariensis variegata* sprayed with GA or heavily pruned produced juvenile shoots. Inflorescences reverted to a vegetative condition when treated with GA. Juvenility did not depend, however, on the continued presence in the tissues of exogenously applied GA, as the shoot tips of treated plants could be used as cuttings and produced juvenile vines several feet in length.—Columbia Univ., N.Y.

3039. Bhatnagar, G. S.
Reproduction by seeds (fruits) in *Jasminum* spp.
Sci. and Cult., 1960, **26**: 192, bibl. 2.

The whole dried fruit is used as seed. Of 16 varieties belonging to 5 species grown at Lucknow only 5 were found to set fruit, and only *J. sambac* "Single Hazara-Bela" was sufficiently successful to be raised from seed commercially.—Nat. bot. Gdns, Lucknow.

3040. Mahajan, M. K.
An abnormal inflorescence in *Jasminum sambac* Linn.
Sci. and Cult., 1960, **26**: 33-4, bibl. 6, illus.

The original corymb transformed into an umbel by coalescence of floral pedicels.

3041. McLean, D. M.
An infectious mosaic of *Jasminum*.
J. Rio Grande Valley hort. Soc., 1960, **14**: 187-8, bibl. 3, illus.

A chlorotic mottling, found to be graft-transmissible, on *Jasminum simplicifolium*.

3042. Tucker, S. C.
Ontogeny of the floral apex of *Michelia fuscata*.
Amer. J. Bot., 1960, **47**: 266-77, bibl. 27, illus.

Changes in the size and shape of the meristem and plastochronic fluctuations during the initiation of different tiers of primordia are described.

3043. The Palm Society. (Ledin, R. B., and others.)
Cultivated palms.
Amer. hort. Mag., 1961, **40**: 1-189, illus.

The whole of the January issue is devoted to palms, with excellent black-and-white photographs of many species. The articles are grouped under: *An introduction to the palms*, including the botany, classification and morphology of native and the commoner cultivated palms; *Culture of the palms*, including vegetative and seed propagation, manuring, pruning, pests and diseases and cold tolerance; *Uses of the palms* in gardens, in greenhouses, in decorative arrangements, as hedges, together with notes on species suitable for Florida, California and Hawaii. There is also a list of about 30 palm collections in various countries, and the handbook is completed by an index of palm names.

3044. Frey, H. G.
Poinsettia growing.
Flor. Exch., 1960, **135**(22): 10-11.

Discussion by a grower of soil preparation, stock plants, propagation, potting and control of height and flowering.

3045. Gianfagna, A. J., Nichols, L. P., and Gesell, S. G.
Poinsettia growing—covering production, insects, diseases.
Flor. Exch., 1960, **135**(11): 14, 16.

An advisory article, including a schedule for preventive disease control.

3046. Goodland, N. L.
Poinsettia.
Park Administ., 1960, **25**: 292, 297, illus.

Buds of *Euphorbia pulcherrima* arise when the day length falls below 13 hours on 5–6 October. The resting stage, when plants should be kept quite dry is from January to April. Poinsettia bleeds easily and a rooting hormone is used to aid healing of the cut stems.

3047. Shanks, J. B.
Research on poinsettia, hydrangea and azalea culture.
Flor. Exch., 1960, **135**(11): 16, and **135**(12): 8, 11.

Advice, based on research results, on forcing these pot plants.

3048. Stewart, R. N.
Inheritance of bract color in poinsettia.
J. Hered., 1960, **51**: 175-7, bibl. 6.

Poinsettias with white bracts differ from the normal red by a single recessive factor designated *wh*. All commercial cultivars with red bracts bred true for red bracts, as did "Pink Ecke" and "New Pink". No pink seedlings have appeared even in descendants of crosses involving the pink parents. "Ecke White" and "Early White" gave all white-bracted seedlings from both self- and cross-pollinations of these 2 varieties. [From author's summary.]—U.S.D.A., Beltsville, Md.

3049. Tompkins, C. M.
A disease of poinsettia stock plants caused by waterlogged soil and its control.
Plant Dis. Reptr, 1959, **43**: 1034-5, bibl. 1, illus.

The symptoms of a stunt disease affecting container-grown poinsettia stock plants are described. Predisposing factors are heavy, poorly drained soils, no drainage outlets in the containers, excessive use of irrigation water and lack of soil aeration. The disease may be controlled by modifying present cultural practices. [Author's summary.]—Univ. Calif., Berkeley.

3050. Rogers, M. N.
Decay of poinsettia cuttings by the soft rot bacterium, *Erwinia carotovora* (Jones) Holland.
Plant Dis. Reptr, 1959, **43**: 1236-8, illus.

A rapid and destructive decay of newly propagated poinsettia cuttings under warm, moist greenhouse conditions was found to be caused by the soft rot bacteria (*Erwinia carotovora*). Inoculation apparently occurred while cuttings were being prepared for insertion into the rooting medium. Careful sanitation to prevent inoculation of the cuttings is the only practicable control measure that can be recommended. [From author's abstract.]—Mo. agric. Exp. Stat., Columbia.

3051. Tompkins, C. M.
Leaf rot of poinsettia cuttings caused by *Rhizoctonia solani* and its control.
Plant Dis. Reptr, 1959, **43**: 1036-7, bibl. 1, illus.

A leaf-rot disease of unrooted and rooted poinsettia softwood cuttings, grown under glass in flats and small pots under excessively wet conditions, is caused by *Rhizoctonia solani*. The disease may be controlled by reducing the frequency of irrigation. [Author's summary.]—Univ. Calif., Berkeley.

3052. Royal Horticultural Society.
The rhododendron and camellia year book, 1961, No. 15.
R.H.S., London, 1960, 9 × 5½ in., pp. 149, illus., 12s. 6d. + 1s. 3d. postage, or U.S.A. $2 post free.

A large part of this volume is taken up with descriptions, some with excellent illustrations, of new introductions to the range of rhododendrons and camellias. There are also articles on rhododendrons in their natural homes and in some famous gardens, including the collection of the King of Sweden. Eighteen popular varieties of *Camellia japonica* are described. Details are also given on how to grow camellias in containers and on how to overcome problems with difficult soils. An article on mineral deficiencies in rhododendron is abstracted below.

3053. U.S. Department of Agriculture.
Growing azaleas and rhododendrons.
Home Gdn Bull. U.S. Dep. Agric. **71**, 1960, pp. 8, illus.

Cultural and plant protection methods outlined.

3054. Smith, A. G., Jr.
Hardy azaleas and rhododendrons for Virginia.
Circ. Va polytech. Inst. **861**, 1960, pp. 3.

Suitable varieties and cultural methods.

3055. Bradley, G. A., and Mayes, R. L.
Azalea nutrition.
Arkans. Fm Res., 1960, **9**(4): 7, illus.

Rooted cuttings of the varieties Hexe and Coral Bell were planted in: (1) a soil from the Arkansas Bottoms, pH 6·0, with a low exchange capacity; (2) a Delta soil, pH 7·3, with a high exchange capacity; (3) an Ozark Upland soil, pH 7·0, with a medium exchange capacity; and (4) a coastal plain soil, pH 5·2, with a low exchange capacity. The pH, iron content and sources of N were varied by the addition of acid peat, chelated Fe and ammonium sulphate, ammonium nitrate or sodium nitrate. For good growth, soils 1, 2, and 3 required additional peat (5 or 15%) and 2 and 3 also required acidifying to pH 4·5–4·8 with ammonium sulphate as the N source. Soil 1 did not require acidification or chelating. Azaleas in soil 4 responded to ammonium sulphate applied alone but responded even better when peat (5–15%) and chelated Fe were also added.

3056. Tod, H.
Mineral deficiencies in rhododendron.
R.H.S. Rhododendron Camellia Yearb. 1961, No. 15, 1960, pp. 38-41, bibl. 1, illus.

Analyses of chlorotic leaves of rhododendrons showed that deficiencies of Mg and/or of K were responsible for the chlorosis in most cases. In 6 cases involving high soil pH values the leaves showed low Mg and/or K values as well as Mn deficiency.—Edinburgh Sch. Agric.

3057. Wilkin, F. E.
Growing waratahs.
N.Z. J. Agric., 1960, **100**: 505-7, illus.

Descriptions of 3 *Telopea* spp. with notes on pruning and pest control.

SUB-TROPICAL FRUIT AND PLANTATION CROPS.

Avocadoes.

(*See also* 3117, 3126, 3590.)

3058. Storey, W. B.
The avocado in Australia.
Yearb. Calif. Avoc. Soc., 1960, **44**: 66-71, bibl. 1, illus.

3059. Gustafson, C. D.
Minimum avocado production costs.
Calif. Citrogr., 1960, **46**: 55-7.
"What are your production costs?"
Yearb. Calif. Avoc. Soc., 1960, **44**: 34-5.

An annual costings analysis is given for trees, 10–25 years of age, yielding 10,000 lb./acre. The total cost per acre was $442.92.

3060. Schroeder, C. A.
Progress report on the avocado breeding program at UCLA.
Yearb. Calif. Avoc. Soc., 1960, **44**: 121-4, bibl. 33.

With particular reference to *Phytophthora*-resistant rootstocks.

3061. Delphey, C. C.
Hybrid avocado trees being tested in Ventura county.
Yearb. Calif. Avoc. Soc., 1960, **44**: 55-7.

The fruit characters of several hybrids are tabulated. The most promising trees were found among the Fuerte-Mexicola crosses.

3062. Soto, T.
Nuevas variedades de aguacates de Puerto Rico. (**New avocado varieties for Puerto Rico.**)
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1958, 1958, **6**: 8-10.

Varieties with fruits withstanding more than a month of cold storage are recommended, together with others suitable for growing in Puerto Rico. In general, the fruit is produced a month later at 1,000 ft. than at sea level.—Univ. P.R., Rio Piedras.

3063. Eggers, E. R.
Propagation of avocado nursery trees.
Yearb. Calif. Avoc. Soc., 1960, **44**: 40-1, bibl. 2.

Advice on choice of site and nursery practice, including heat treatment against *Phytophthora cinnamomi*.

3064. Dickinson, T. A.
Topworking avocados.
West. Fruit Gr, 1960, **14**(7): 27-8, illus.

Selected trees should have no symptoms of sunblotch, root rot or chlorosis and should be grafted in February, March or April. Paper barriers may be used to protect the graft, and the stump area below should be whitewashed to prevent sunburn. The paper should be opened up 6–8 weeks later to provide more ventilation and allow the new growth to emerge.

3065. Trask, E. E.
Protecting newly grafted avocado stumps and scions from sunburn.
Yearb. Calif. Avoc. Soc., 1960, **44**: 33, illus.

By covering the cut surfaces with an asphalt emulsion paint, followed, when dry, by a white latex-base paint.

3066. Richards, S. J., Warneke, J. E., and Weeks, L. V.
Irrigation of avocados.
Yearb. Calif. Avoc. Soc., 1960, **44**: 73-4.

Trees irrigated when tensiometer readings at 1 ft. depth, 4 ft. from the tree, reached ½ bar gave average yields of 79 lb. in 1958 and 83 lb. in 1959. The yields of those not irrigated until the reading was 10 bars were 48 lb. in 1958 and only 8 lb. in 1959. The trunk diameters of the latter trees were also considerably smaller.—Univ. Calif., Riverside.

3067. Trask, E. E.
Some factors affecting the accumulation of chlorides in avocado soils.
Yearb. Calif. Avoc. Soc., 1960, **44**: 38-9.

The build-up of Cl in the soil, enhanced by modern methods of tensiometer-controlled irrigation, can be prevented by periodic heavy irrigations, or, where sub-surface drainage is poor, by irrigating only beneath the crowns which leaches the salts into the inter-rows. In general, irrigation water containing over 150 p.p.m. of chlorides will cause tip-burn in avocadoes.

3068. Miller, M.
Avocado pruning to regulate crop production.
Yearb. Calif. Avoc. Soc., 1960, **44**: 42-4, illus.

Severe pruning of Nowels trees prior to an anticipated heavy crop was found to be effective in reducing the current season's yield while increasing that of the following year; it also increased the average fruit size by eliminating very small fruit and hastened maturity.

3069. Embleton, T. W., and others.
Nitrogen fertilization of the MacArthur avocado.
Yearb. Calif. Avoc. Soc., 1960, **44**: 93-6, bibl. 4.

Leaf analyses indicated that for maximum yield the N content in spring leaves should be at least 1·8%. For this level to be attained the MacArthur variety required substantially more N fertilization than Fuerte or Hass.

3070. BAHN, K. C.
Pretreatments of plant roots on subsequent cation accumulation by excised roots.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 32-57, bibl. 22.

Avocado plants were grown with a complete nutrient solution at 3 N levels (7, 70, 280 p.p.m.) supplied exclusively as NH_4^+, urea or NO_3^-, with additional treatments containing 0·01 N HCO_3^- with the medium N treatment. Excised roots were used to study Na accumulation from 0·005 N sodium chloride, with and without 0·02 N ammonium chloride. Results showed that Na accumulation was greatest with NO_3^- pre-treatment, and it increased with increase in N supply, particularly when N was in the form of urea. The NH_4^+-N plus HCO_3^- treatment had a toxic effect on the plants, but with NO_3^--N and urea-N the HCO_3^- considerably reduced subsequent Na accumulation.

3071. LABANAUSKAS, C. K., AND OTHERS.
Effects of nitrogen and irrigation treatments on the micronutrient concentration in Hass avocado leaves.
Yearb. Calif. Avoc. Soc., 1960, **44**: 97-100, bibl. 16.

The Cu content was reduced by high rates of N fertilization, the Mn content by too low or too high soil moisture availability, and B deficiency was induced by infrequent heavy irrigations. Zinc, Cu and Fe concentrations were not affected by irrigation practices. [See also *H.A.*, 29: 780.]—Univ. Calif., Riverside.

3072. BINGHAM, F. T.
Magnesium deficiency of the Hass avocado tree.
Yearb. Calif. Avoc. Soc., 1960, **44**: 101-5, bibl. 11, illus.
Magnesium deficiency in avocado trees.
Calif. Citrogr., 1960, **45**: 412-13.
Magnesium deficiency in avocados.
West. Fruit Gr, 1960, **14**(7): 33.

The Mg content of leaves from trees grown in nutrient solutions deficient in Mg was less than 0·15%, and where the deficiency was severe the Mg content fell below 0·10%. Symptoms of Mg deficiency are described. The normal range is 0·25–0·50%.—Univ. Calif., Riverside.

3073. BURNS, R. M., AND OTHERS.
Correlation of soil series and avocado root rot damage in the Fallbrook area.
Yearb. Calif. Avoc. Soc., 1960, **44**: 110-13, bibl. 5, illus.
Avocado root rot linked with soil types.
Calif. Citrogr., 1960, **46**: 27.
LARUE, J. H., AND BURNS, R. M.
Tulare Co. avocado soil survey.
Calif. Citrogr., 1961, **46**: 84-7, bibl. 1, illus.

Most of the trees killed or damaged by *Phytophthora cinnamomi* were found on soils with poor drainage and a high clay content.

3074. GOODALL, G. G., AND OTHERS.
Soil stratification and *Phytophthora* root rot occurrence in avocado orchards.
Yearb. Calif. Avoc. Soc., 1960, **44**: 125-9, bibl. 14, illus.

In an orchard showing pronounced variation in the severity of root rot, infection was most noticeable where the soil contained a layer of coarse yellow sand 2 in. thick at a depth of 17–18 in. Such stratification caused locally inefficient drainage favourable to the development of the pathogen.—Univ. Calif., Riverside.

3075. ZENTMYER, G. A., AND MIRCETICH, S. M.
Results with new method of testing for resistance to *Phytophthora* root rot of avocado.
Yearb. Calif. Avoc. Soc., 1960, **44**: 107-9, bibl. 2, illus.

Seeds were germinated in sterilized sand and the seedlings transferred at a height of 3–4 in. to a nutrient solution. Of the 2,932 seedlings tested by adding *P. cinnamomi* inoculum to the nutrient solution only 9% showed less than 90% infection; these included Duke seedlings, West Indian types from Florida and Puerto Rico, *Persea coerulea* from Venezuela and *Alseodaphne* sp. from Asia.—Univ. Calif., Riverside.

3076. ZENTMYER, G. A., AND GILPATRICK, J. D.
Soil fungicides for prevention and therapy of *Phytophthora* root rot of avocado.
Abstr. in *Phytopathology*, 1960, **50**: 660.

Two soil fungicides with low phytotoxicity, Dexon (p-dimethylaminobenzenediazo sodium sulphonate) and SD4741 (*O,O,O*-trimethyl phosphorothioate) gave good control of *Phytophthora* root rot of avocado seedlings in the greenhouse when applied as weekly drenches. Solutions were applied to give dosages in the soil of: Dexon, 10, 20 and 40 p.p.m.; SD4741, 50, 100, and 200 p.p.m. In three similar trials the disease was strikingly reduced by all treatments, except the lowest dosage of Dexon, when chemicals were applied at the time seedlings were transplanted into naturally infested soil, and weekly thereafter for 12 weeks. Growth of seedlings in treated soil ranged from 2 to 4 times that of controls; root weight was 4–10 times that of controls. All treatments resulted in reduction of *P. cinnamomi* in treated soil; the fungus could not be recovered from soil treated with the highest dosages of the chemicals in several cases. The highest dosages caused some phytotoxicity. Treatment was begun with the same three dosages of the chemicals after root infection had taken place in infested soil for 3 to 6 weeks. Weekly applications of Dexon (10 p.p.m.) and SD4741 (50 and 100 p.p.m.) resulted in gradual recovery of the plants that were not in extremely severe stages of the disease at the time of treatment.

3077. Mircetich, S. M., and Zentmyer, G. A.
Rhizoctonia seed and root rot of avocado.
Yearb. Calif. Avoc. Soc., 1960, **44**: 119-20.

A laboratory study of the infection of avocado seedlings with *R. solani*.

3078. Sher, S. A., Foote, F. J., and Boswell, S. B.
A root-lesion nematode disease of avocados.
Plant Dis. Reptr, 1959, **43**: 797-800, bibl. 2. illus.

For another account, see *H.A.*, 30: 1118.

3079. Cook, P. H.
Soil fumigation and avocados.
Calif. Citrogr., 1960, **45**: 380, illus.

Growth of avocadoes in a grove where walnuts had been grown previously was nearly 3 times greater on soil which had been fumigated with D-D (1,200 lb./acre) than on untreated soil.

3080. Fleschner, C. A., and Scriven, G.
Production and colonization of imported natural enemies of avocado mite pests.
Yearb. Calif. Avoc. Soc., 1960, **44**: 114-18, bibl. 2, illus.

Mass rearing methods for *Stethorus picipes*; there are indications that this predator is becoming established.

3081. Bean, R. C., Rasor, J. P., and Porter, G. G.
Changes in electrical characteristics of avocados during ripening.
Yearb. Calif. Avoc. Soc., 1960, **44**: 75-8, bibl. 3.

Electrical impedance of ripening avocadoes has been measured with alternating currents ranging from 600 to 60,000 c.p.s. These measurements indicate that almost two-thirds of the impedance of the avocado may be due to capacitive reactance. Comparisons were made between changes in respiration and changes in impedance during ripening of avocadoes. An inverse correlation was observed between the changes in impedance and respiration. [Authors' summary.]—Univ. Calif., Riverside.

3082. Grant, W. C.
Influence of avocados on serum cholesterol.
Yearb. Calif. Avoc. Soc., 1960, **44**: 79-88, bibl. 25.

This medical study contains data on the fatty acid composition of avocado oil.

Carobs.

3083. Coit, J. E.
Carob investigations; report of progress.
Yearb. Calif. Avoc. Soc., 1960, **44**: 61-5, illus.

The following aspects of carob culture in semi-arid areas of California are discussed: propagation, tillage, pests and diseases, yields, harvesting methods, uses (including an analysis of the pulp) and varieties.

Citrus—general.

(*See also* 3603.)

3084. U.S. Dep. Agric., Foreign Agricultural Service.
World citrus production: record orange crop.
Foreign Agric. Circ. U.S. Dep. Agric. **FCF 4-60**, 1960, pp. 4.

The 1959/60 orange crop a record, but grapefruit and lemon production less than previous year.

3085. Buffa, A., de la Gironière, H., and Lemoine, J.-P.
L'industrie des agrumes en Algérie. **(The citrus industry in Algeria.)**
Fruits d'Outre Mer, 1960, **15**: 401-5, bibl. 3.

The data include: production figures for oranges, lemons and grapefruit in all citrus-growing countries for 1958-59; Algerian production figures for 1959; brief notes on citrus growing and varieties in Algeria; and figures for the composition of orange, grapefruit and lemon juices.

3086. Moati, P., and Rochette, P.
Agrumiculture de la vallée du Chélif. **(Citrus growing in the Chélif valley.)**
Rev. agric. A.F.N., No. 2133, reprinted in *Fruits et Prim.*, 1960, **30**: 149-51.

Notes are given on soils, varieties (orange, clementine and grapefruit), pruning, fertilization (350 kg. ammonium nitrate per ha.), culture *vs.* non-culture, subsoiling after 10 years to destroy the pan resulting from cover cropping and irrigation under alkaline conditions, and irrigation methods. —Serv. agric. Orléansville.

3087. Wallace, A.
California oranges vs. Florida oranges.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 123-9.

Orange production in the 2 states compared.

3088. Botham, J. R., and Gillespie, K.
Citrus research [in South Australia].
J. Agric. S. Aust., 1960, **64**: 3-8, illus., and *Fruit World, Melbourne*, 1960, **61**(9): 37, 39.

The results of a trial of clipping *vs.* plucking in orange harvesting, expressed as per cent storage spot, showed no differences. In trials against red scale 2½% white oil and 0·2% Rogor 40 were more effective than 0·2% malathion, but no spraying treatment matched cyanide fumigation. During the past 3 seasons increased yields of Washington Navel oranges have followed the use of 0·1% DDT on the flowers for thrips control. It is thought that thrips, mainly *Taeniothrips kellyanus*, cause immature fruit drop. Work on tristeza and xyloporosis is in progress.

3089. Mori, K.
An analytical study on the structure of a mandarin orange orchard on sloping land. [Japanese, with English summary 2½ pp.]
Mem. Fac. Agric. Kagawa **5**, 1960, pp. 124, bibl. 64.

The economics of sloping orange groves are discussed, with information on land utilization, productiveness and costs.

3090. Schifani, C.
Il costo di produzione in agrumicoltura. (**Production costs in citrus growing.**)
Tecn. agric., 1960, **12**: 147-62, bibl. 5, illus.

Production costs in Sicily are high, mainly because yields are low. The relative importance is discussed of the costs of organic manures, chemicals, fertilizers, irrigation and plant protection.

3091. Savage, Z.
Citrus yield per tree by age.
Citrus Ind., 1960, **41**(12): 11, 20-1.
Late orange yield, boxes per tree.
Citrus Veg. Mag., 1960, **23**(4): 17, 24.

Average, high, and low yields expected in each year of age, up to 45–55 years, are tabulated for early orange, mid-season orange, late orange, seedy grapefruit, seedless grapefruit, tangerine and Temple orange in Florida. The second article records the late orange data only.

Citrus—varieties, propagation, rootstocks and planting.

(*See also* 3158, 3563.)

3092. Tanaka, T.
A revision of *Osmocitrus*, a section of the genus *Citrus*. (Revisio Aurantiacearum XIII).
Bull. Univ. Osaka Pref., Ser. B, 1960, **10**: 9-13, bibl. 15.

A new sub-section, *Protosmocitrus*, is created for *Citrus ichangensis*, in addition to the existing sub-sections *Euosmocitrus* and *Pseudoacrumen*.

3093. Adriance, G. W.
Citrus trees from nucellar seedlings.
J. Rio Grande Valley hort. Soc., 1960, **14**: 18-20, bibl. 8.

A short review.

3094. Khan, D. A.
Comparison of growth characteristics of some promising varieties of mandarin.
Punjab. Fruit J., 1960, **23**(80): 1-8, bibl. 39, illus.

Girth, height and spread of the tree, growth of shoots, and number and size of leaves were among the characteristics studied in 8 varieties. It is concluded that Coorg, Natal Naartje, Nagpuri and Mangal Singh were the most vigorous, in that order, and Wilking the least vigorous.—Res. Inst., Lyallpur.

3095. Crescimanno, F. G.
Migliorare la coltura del mandarino. (**Improving the mandarin crop.**)
Inf. Ortofruttic., 1960, **1**: 7-8, illus.

The late ripening variety Ciaculli is superior to the extensively grown Avana in fruit quality and has relatively few seeds. Recommendations are made for manuring and irrigation.

3096. Milella, A.
Le cultivar di arancio diffuse in Sardegna. (**Orange varieties in Sardinia.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 287-325, illus.

Of the 19 varieties described 6 are recommended for extended cultivation.

3097. Asdullah, M.
Economics of raising one acre citrus nursery (Malta and Sangtra).
Punjab Fruit J., 1960, **23**(80): 12-16.

Analysis of income and expenditure over 6 years.

3098. Hensz, R. A.
Effects of X-rays and thermal neutrons on citrus propagating material.
J. Rio Grande Valley hort. Soc., 1960, **14**: 21-5, bibl. 8.

The X-ray dose for 50% mortality in samples of seeds of 3 grapefruit and 3 orange varieties was between 5,000 and 10,000 r. For thermal neutrons the exposure time for the same mortality was 3–6 hours for Valencia orange seeds and 12–15 hours for the grapefruit seeds. An X-ray dose of 6,000 r killed more than 50% of the buds of nucellar Webb Redbush exposed to it.—Tex. agric. Exp. Stat., Weslaco.

3099. Norman, G. G.
Florida State Plant Board program for virus-free budwood.
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1958, 1958, **6**: 1-7, bibl. 6, illus.

Policy, procedure and methods for supplying citrus material free from tristeza, psorosis, xyloporosis and exocortis.

3100. Botham, J. R.
Rootstocks for citrus.
J. Agric. S. Aust., 1960, **63**: 490-2, illus.

Advice for S. Australian conditions.

3101. Shannon, L. M., Frolich, E. F., and Cameron, S. H.
Characteristics of *Poncirus trifoliata* selections.
J. Rio Grande Valley hort. Soc., 1960, **14**: 108-17, bibl. 10, illus.

The 36 trifoliate orange selections investigated were divided into large-flowered and small-lowered groups, the former having an upright habit with a single trunk and being more susceptible o "unknown chlorosis" than the latter, which were bushy with multiple trunks. Removing suckers to produce single trunks during propagation reduced the average weight of small-flowered seedlings to half that of the large-flowered, and 5-year-old Washington Navel oranges on the latter were 20% larger than those on the former. All the selections were susceptible to lime-induced chlorosis.—Univ. Calif., Los Angeles.

3102. BITTERS, W. P.
Citrus rootstocks for desert area.
Calif. Citrogr., 1960, **45**: 349, 363-4.

Sour orange has good resistance to gummosis, is moderately tolerant to salt, not severely affected by lime chlorosis, and produces good yields of quality fruit. Rough lemon produces heavy crops at an early age on light desert soils, but fruit quality is very poor. Cleopatra mandarin gives good yields of high quality fruit, is tolerant to tristeza, and is more resistant to gummosis and tolerant to salt than rough or sweet lemon. King and Batanges mandarins and *C. taiwanica* also appear promising, and *C. macrophylla* may be used for lemons.—Univ. Calif., Riverside.

3103. YOSHIMURA, F., AND OTHERS.
Studies on citrus root-stocks. III. Growth response of seedlings of some citrus varieties to soil temperature in summer and winter. [Japanese, with English summary ¾ p.]
J. hort. Ass. Japan, 1960, **29**: 107-13, bibl. 16, illus.

Pot culture experiments indicated that in the summer, with soil temperatures reaching 24–31° C., *Citrus natsudaidai*, *C. intermedia* and *C. grandis* var. *hogen* were the most suitable rootstocks, followed by *C. junos*. For winter conditions, however, under which soil temperatures remain at, or slightly above, 8·5° C., the deep rooted varieties, *C. junos* and *C. natsudaidai* and the cold-resistant types *Poncirus trifoliata* and *C. leiocarpa* were to be preferred.

3104. YOUNG, R. H., PEYNADO, A., AND COOPER, W. C.
Effect of rootstock-scion combination and dormancy on cold hardiness of citrus.
J. Rio Grande Valley hort. Soc., 1960, **14**: 58-65, bibl. 6, illus.

The effect was studied of 4 hours' exposure to 22·8° F. on 3-year-old citrus trees of 4 species growing on different rootstocks. Satsuma mandarin was frost resistant, Mexican lime frost sensitive, Red Blush grapefruit and Valencia orange intermediate. Where the rootstock had induced dormancy, as with Red Blush on sour orange, Sunki mandarin and Troyer citrange, cold hardiness was increased, but the rootstock had no effect on the hardiness of Satsuma mandarin or the susceptibility of Mexican lime.—U.S.D.A. and Tex. agric. Exp. Stat., Weslaco.

3105. WOODRUFF, R. E., AND OLSON, E. O.
Effects of rootstocks on physical characteristics and chemical composition of fruit of six citrus varieties in Texas.
J. Rio Grande Valley hort. Soc., 1960, **14**: 77-84, bibl. 12.

The varieties were Meyer lemon, Navel, Marrs and Hamlin oranges, Clementine tangerine and Orlando tangelo. The most marked differences were observed in fruit from trees on Columbian sweet lime stock, which were characterized by large size, thick rind, low total solids and low acid content. No appreciable differences in the juices from fruits grown on other rootstocks were noted.—U.S.D.A. and Tex. agric. Exp. Stat., Weslaco.

3106. SCHNEIDER, H.
Bud-union trouble in *macrophylla* rootstocks of Frost Nucellar Eurekas.
Calif. Citrogr., 1960, **46**: 2, 33, bibl. 1, illus.

Samples of bud-union tissue from 6 trees planted in 1949 were examined in 1953, 1956, 1958, 1959 and 1960. In 1958 necrosis of the sieve tubes was observed immediately below the bud union, suggesting incompatibility in 4 of the trees, one of which showed severe decline, the whole tree being affected by 1959. A second tree, seriously affected in 1958, showed almost normal phloem tissue below the bud union by 1960, but the Eureka lemon scion was severely affected by lemon sieve-tube necrosis. Necrosis was not extensive or prolonged enough to cause decline in the other 4 trees.

3107. SINCLAIR, J. B., AND BROWN, R. T.
Effect of exocortis disease on four citrus rootstocks.
From abstr. in *Phytopathology*, 1960, **50**: 577.

The effects of exocortis on the growth (trunk circumference), yield and symptom expression of Washington Navel on Cleopatra mandarin, sweet orange, trifoliate orange and Rangpur lime for a 5-year period are summarized. That Cleopatra mandarin and sweet orange were adversely affected by the virus, although they exhibited no typical exocortis symptoms, was indicated by the significantly slower growth in trunk circumferences of infected trees compared with healthy trees. Scions on rootstocks of trifoliate orange, Rangpur lime and sweet orange showed a significant reduction in the yield of diseased trees compared with healthy trees, but there was no significant reduction in yield between healthy and diseased scions on Cleopatra mandarin rootstock. Differences between the trunk circumferences of healthy and diseased trees on all 4 rootstocks tended to become wider each year.

3108. Cooper, W. C., and Lime, B. J.
Quality of red grapefruit on old-line grapefruit varieties on xyloporosis- and exocortis-tolerant rootstocks.
J. Rio Grande Valley hort. Soc., 1960, **14**: 66-76, bibl. 11.

The rate of change during ripening was similar for all rootstocks, but marked differences in fruit composition were observed. Fruit from trees on rough lemon stock was heavier, larger, had a thicker rind, lower acid content, less soluble solids and deeper red colour. In general, fruit on Cleopatra mandarin, Red Blush grapefruit, citrumelo 4475, Uvalde citrange and sour orange stocks were similar in quality and superior to those on rough lemon stock.—U.S.D.A., Weslaco.

3109. Olson, E. O.
Evaluation of rootstocks for Valencia orange trees following inoculation under screenhouse conditions with a severe strain of tristeza virus.
J. Rio Grande Valley hort. Soc., 1960, **14**: 29-32, bibl. 7.

Of the 16 rootstocks tested for tristeza resistance and vigour when grafted with nucellar Valencia orange, Rangpur lime was outstanding for growth, and Troyer citrange, Cleopatra mandarin, Morton citrange and Ponkan mandarin were also suitable. Australian sour orange and Natsu Mikan need further testing. [See also *H.A.*, 29: 808.]—U.S.D.A. and Tex. agric. Exp. Stat., Weslaco.

3110. Poidevin, J.
Observations sur la plantation des agrumes en Corse. (**Observations on citrus planting in Corsica.**) [English, German, Spanish and Russian summaries approx. 13 lines each.]
Fruits d'Outre Mer, 1960, **15**: 419-22, illus.

Among a series of planting dates from late March to late May the best period was the second week in April and the least favourable the end of March. Explosives were less costly than mechanical diggers for making planting holes. Establishment costs are given for different planting densities.

Citrus—climatic factors and irrigation.

(*See also* 2134, 3095, 3104, 3153.)

3111. Cooper, W. C., and Furr, J. R.
Research planned on responses of Valencias to microclimate, particularly temperature.
Citrus Ind., **41**(12): 14, 16-19, 21, bibl. 5, illus.

Details of experimental procedure.

3112. Baldini, E.
Alcune osservazioni sugli effetti della "imbiancatura" dei tronchi negli alberi da frutto. (**Some observations on the effects of white-washing the trunks of fruit trees.**) [English summary 13 lines.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 89-102, bibl. 18, illus.

The cambial temperature of white-washed Tarocco sweet orange trees was much lower than that of control trees but higher than the air temperature. For example, the mean daily temperatures at 1 o'clock in July in a meteorological cabinet and in the cambium of white-washed and control trees were 29·9, 33·3 and 40·9° C., respectively. The amount of functional phloem was greater in white-washed trees than in the controls.—Ist. Colt. arb., Univ. Bologna.

3113. Ōgaki, C., and Tomita, E.
Experiments on the control of sun-scald of early Satsuma orange fruits. No. 1. [Japanese, with English summary ½ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 6-10, bibl. 5.

The best control of sun-scald was obtained by bagging the fruits, but some control was obtained by covering them with a net and by supporting the shoots with bamboos. Painting the fruits with wax increased the percentage of damaged fruits.

3114. Young, R. H., and Peynado, A.
Changes in citrus-leaf temperatures during freezing.
J. Rio Grande Valley hort. Soc., 1960, **14**: 53-7, bibl 7.

In the 6 species investigated the changes in leaf temperature during freezing followed the same pattern, viz. a rise as freezing started followed by a fall after the leaf was fully frozen. The leaves of actively growing plants froze more quickly and suffered more damage than those of dormant plants.—U.S.D.A. and Tex. agric. Exp. Stat., Weslaco.

3115. Eaks, I. L.
Physiological studies of chilling injury in citrus fruits.
Plant Physiol., 1960, **35**: 632-6, bibl. 18.

The physiological responses to chilling injury were evaluated by determining the rate of CO_2 evolution, the rate of O_2 uptake, internal atmosphere and total CO_2 content of chilled and non-chilled fruits at 20° C. A pronounced increase in the rate of CO_2 evolution was associated with the chilling treatments. There was a cumulative time-temperature influence of chilling exposure upon the degree of stimulation in CO_2 evolution. An increase in the rate of O_2 uptake at 20° C. by immature orange, lemon and lime fruits was observed after exposure at 0° and 10° C. Determinations of the composition of the internal atmosphere and total CO_2 content of orange fruits show that physical processes, such as the release of dissolved CO_2 as the fruits warmed, cannot account for the increased amount of CO_2 involved after a chilling exposure. It is suggested that the stimulated respiratory rate of chilled fruits may arise from changes in the relative amounts of certain metabolites which are rapidly oxidized at the non-chilling temperature. [Author's summary.]—Univ. Calif., Riverside.

3116. Turrell, F. M., Austin, S. W., and Perry, R. L.
Frost control.
West. Fruit Gr, 1960, **14**(9): 21-2, bibl. 5.
Turrell, F. M., and Austin, S. W.
Factors influencing wind machine operation.
Calif. Citrogr., 1960, **46**: 38, 52-4, illus.

When using wind machines the best results are obtained when they are started at an evening temperature of 32–35° F. and run until the morning temperature reaches 35° F. or more. The rate of cooling of the fruit is slow at these temperatures. The soil should be wet for a depth of 18 in. from the surface to allow heat in the lower soil to be conducted to the surface more quickly. Flooding of the whole grove with warm water also reduces frost damage. The use of heaters combined with wind machines is also briefly discussed.—Univ. Calif., Riverside and Los Angeles.

3117. U. S. Weather Bureau Fruit - Frost Service.
Firing information.
Calif. Citrogr., 1960, **46**: 16.

Temperatures inside the fruit at which freezing begins are listed for oranges, grapefruit, lemons and avocadoes, and conditions in the orchard which necessitate the lighting of heaters are indicated.

3118. Lawrence, F. P.
Some aspects of banking citrus trees.
Citrus Ind., 1960, **41**(11): 5, 9.

In Florida all young trees should be banked [earthed up] by 15 November to protect the trunks from frost damage. Cuprous oxide at 3 oz./gal. + ⅔ oz. chlordane 40% w.p. painted onto the bark before banking controls termites and fungi. Stabilizing the banks against wind and rain erosion may be achieved by spraying with Vulconol, a water soluble plastic-type material. The banks should be removed completely as soon as the damaging cold weather has passed.—Univ. Fla.

3119. (Hendershott, C.)
Chemical offers frost protection.
West. Fruit Gr, 1960, **14**(8): 26.

MH-30, sprayed onto young citrus trees, produced temporary dormancy and this increased their frost resistance.

3120. (Rutledge, R. W.)
Hurricane Donna damages citrus.
Citrus Ind., 1960, **41**(10): 9.

Damage in Florida estimated at 35–40% of the total grapefruit crop and 6–10% of the orange crop.

3121. Gerard, C. J., and Sleeth, B.
The use of tensiometers as an aid in the irrigation of citrus groves.
J. Rio Grande Valley hort. Soc., 1960, **14**: 47-52, bibl. 3, illus.

The most suitable depth for taking tensiometer readings proved to be 24 inches. At this depth readings of 50 to 70 indicated that water was needed.—Tex. agric. Exp. Stat., Weslaco.

3122. Schade, R. O.
Rapid change to sprinklers in Tulare County.
Calif. Citrogr., 1960, **45**: 388, 416-17, illus.

Advantages of low-volume sprinklers over other irrigation methods include: more uniform water distribution, the employment of less skilled labour, water conservation, low application rates which can be used on soils with low infiltration rates, and increased production. A description is given of a low-volume sprinkler system as a permanent installation.

3123. Stolzy, L. H., and Szuszkiewicz, T. E.
Water intake and soil surface conditions.
Calif. Citrogr., 1960, **45**: 309, 311, bibl. 2.

Treatments compared in a sandy loam orchard of mature Navel oranges included: (1) sprinkler irrigation, fumigation (DD at 70 gal./acre) and mulch; (2) sprinkler irrigation and fumigation; (3) sprinkler irrigation and mulch; (4) sprinkler irrigation; (5) furrow irrigation, fumigation and chiseling; and (6) furrow irrigation and chiseling. Water intake rates in inches per hour are tabulated for each treatment. Mulching greatly improved water intake rates, and the intake from sprinkler irrigation was faster than that from furrow irrigation.—Univ. Calif., Riverside.

Citrus—soils and nutrition.

(*See also* 1950, 1968, 2176, 3095, 3123, 3154, 3565, 3568.)

3124. Koto, M., and Takeshita, S.
Studies on Unshiu orange orchard soils in Kanagawa prefecture. No. 1. Physical and chemical properties of orange orchard soils. Part 1. [Japanese, with English summary ⅓ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 1-5, bibl. 6.

Properties of 3 soil types, viz. volcanic ash, volcanic lapilli and ash, and Ninomiya formation soil.

3125. Amizet, L.
Quelques réflexions sur l'emploi des engrais en arboriculture fruitière. (**Some reflections on the use of manures in fruit growing.**)
Fruits et Prim., 1960, **30**: 41-2.

The commonest rates of mineral fertilization in the Mitidja district of Algeria are 0·4 kg. N, 0·6 kg.

P_2O_5 and 0·96 kg. K_2O per tree. Organics should be the basis of citrus manuring.

3126. HUFFAKER, R. C.
Cation and anion exchange capacities in roots and leaves of citrus and avocado.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 76-8, bibl. 8.

Leaf and root samples from chlorotic, non-chlorotic, high- and low-N types of citrus and avocado were saturated with calcium nitrate, washed and leached with dilute hydrochloric acid or with ammonium oxalate followed by dilute acetic acid. Results of tests on the leachates showed that tissue from plants grown at high-N levels had higher cation and anion exchange capacities than tissue from plants grown at low-N levels, and this was also true for chlorotic plants compared with non-chlorotic plants.

3127. LALATTA, F.
L'applicazione della diagnostica fogliare alla coltura dell'arancio (*Citrus sinensis* O.). **Application of leaf analysis to sweet orange growing.**
Tecn. agric., 1959, **11**: 620-30, bibl. 17.

A review of the technique.

3128. JONES, W. W., AND EMBLETON, T. W.
Leaf analysis—nitrogen control program for oranges.
Calif. Citrogr., 1960, **45**: 349, bibl. 6.

Leaf samples should be taken from August to October from non-fruiting, non-flushing terminals of healthy trees. Areas of different tree size, quality, etc., should be sampled separately. In a uniform area 5–10 acres may be sampled as 1 unit, picking 2–4 leaves from alternate trees on the left and right of the sampler to give a total of 75–100 leaves per sample. The leaves should be washed in water, dried at 60° C. and ground to 40 mesh. Levels of 2·4–2·6% N are regarded as adequate. —Univ. Calif., Riverside.

3129. WALLACE, A.
Nitrogen nutrition.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 255-62, bibl. 47.

A review, largely concerned with citrus.

3130. IWASAKI, T., AND OWADA, A.
Studies on the control of alternate bearing in citrus. III. The effect of fertilizing in late autumn on the number of flowers and the growth of shoots. [Japanese, with English summary $\frac{1}{4}$ p.]
J. hort. Ass. Japan, 1960, **29**: 101-6, bibl. 10, illus.

The application of N fertilizer in late autumn to Satsuma orange and lemon trees tended to increase the number of flowers and shoots in the following spring, the extent depending on the nutritional status of the trees. The addition of P and K to the fertilizer produced no marked difference, and, by themselves, these nutrients had little effect. A foliar spray of urea appeared to be more effective than a soil dressing. [For part II, see *H.A.*, 31: 1247.]

3131. RASMUSSEN, G. K., AND SMITH, P. F.
Oxalic, malic and citric acid content of *Citrus sinensis* leaf tissue. I. Effect of Ca, K, and Mg.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): xv.

When the Ca level supplied to sand cultures was raised, the total acids extracted from orange leaves increased considerably, primarily because of an increase in oxalic acid. The Ca content ranged from 1·5 to 4·5% of the dry weight, and, as it increased, oxalic acid rose from 0·20 to 1·0 m.eq./g. Malic acid increased, but to a lesser degree, over the same Ca range. Oxalic acid increased from 0·42 to 0·67 m.eq./g. and the K level increased from 0·32 to 2·0%, when the Ca level was held between 2·5 and 3·0%. K had no effect on malic or citric acid levels, and Mg, which ranged from 0·20 to 0·80% of the dry weight, had no effect on the oxalic, malic or citric acid levels. The citric acid levels ranged from 0·15 to 0·30 m.eq./g. dry weight of leaf tissue independently of the cation levels.—U.S.D.A., Orlando, Fla.

3132. SPENCER, W. F., AND WANDER, I. W.
A comparison of magnesium sources in young orange trees.
Citrus Ind., 1960, **41**(12): 5-6, 8, 10, 24, bibl. 14.

Treatments of Valencia and Pineapple orange trees included Mg from sea water magnesia, Emjeo, dolomite and olivine, each applied at 1, 3, and 9% MgO content of the fertilizer. Olivine and dolomite were also broadcast at 206 and 2,340 lb./acre and at 115 and 1,040 lb./acre, respectively. Tree growth was unaffected by either source or rate of application, but the leaf-Mg content increased as the Mg rate was increased and was highest in trees treated with sea water magnesia, followed by Emjeo and dolomite. Olivine was a poor source of Mg. No Mg deficiency symptoms developed when the leaf level in July was more than 0·33%.—Fla Citrus Exp. Stat., Lake Alfred.

3133. WALLIHAN, E. F., AND EMBLETON, T. W.
Iron chlorosis.
Calif. Citrogr., 1961, **46**: 67, 87, 89, bibl. 2.

Causes and correction with chelates discussed.

3134. WALLACE, A., AND MUELLER, R. T.
Studies with chelated zinc and manganese on plants.
Spec. Rep. Univ. Calif., Los Angeles, 1960, No. 2, pp. 107-17, bibl. 11.

Macadamia, pyracantha and rough lemon cuttings in solution culture all absorbed Zn from ZnEDTA. Absorption was greater at pH 5 than at pH 8·5. [See also *H.A.*, 29: 2844.]

Citrus—weed control, pruning and fruit drop.

(*See also* 1807, 3224.)

3135. KRETCHMAN, D. W.
Control of annual weeds in non-bearing citrus groves.
Proc. 13th annu. Mtg south. Weed Conf., 1960, pp. 62-6, bibl. 3.

Herbicides were applied in 1958 under Pineapple orange trees on rough lemon and under various citrus seedlings, and in 1959 under 3-year-old Valencia oranges. The only compounds to cause any crop injury were atrazine and diuron; the best weed control after 6 months (85–88%) was given by simazine at 5 and 10 lb./acre.—Citrus Exp. Stat., Lake Alfred, Fla.—From *Weed Abstr.*, **9**, No. 1416.

3136. KRETCHMAN, D. W.
Controlling weeds and brush in citrus grove ditches.
Proc. 13th annu. Mtg south. Weed Conf., 1960, pp. 53-61, bibl. 2.

Jussiaea peruviana, *J. angustifolia* and *J. scabra* growing on ditch banks were well controlled for 12 months by August applications of diuron pellets at 20 lb./acre, monuron at 20 lb./acre and monuron + TCA granular at 22 lb./acre. In another trial fenuron + dalapon gave 75% control of 9 species for 12 months. No treatment injured citrus trees growing 30 ft. from the edge of treated plots. Ditch bank erosion occurred on plots treated with 20 lb./acre diuron.—Citrus Exp. Stat., Lake Alfred, Fla.—From *Weed Abstr.*, **9**, No. 1415.

3137. DICKINSON, T. A.
Machines for pruning.
West. Fruit Gr, 1960, **14**(6): 47-8, illus.

Mechanical methods of pruning lemon trees are described, including: (1) a topping rig with a series of hydraulically-rotated saws on an overhead boom; (2) Kimball's Whirlybird, a helicopter-like topping rig; (3) a truck-borne hedging rig; (4) sickle bar rigs for both topping and hedging; and (5) manually-wielded power saws and a pruning tower.

3138. REITZ, H. J.
Fruit drop reducing chemical cleared for use.
Citrus Ind., 1960, **41**(10): 3.

2,4,5-TP is recommended as a single spray (20 p.p.m.), alone or combined with wettable sulphur, during October or November for the reduction of pre-harvest drop in Pineapple, Temple and seedling oranges.—Fla Citrus Exp. Stat., Lake Alfred.

Citrus—diseases.

(*See also* 1860, 2176, 3099, 3107, 3109, 3182-3187, 3563.)

3139. SALIBE, A. A.
Leaf curl—a transmissible virus disease of citrus.
Plant Dis. Reptr, 1959, **43**: 1081-3, bibl. 6, illus.

Transmitted to several species by budding; symptoms described.

3140. REICHERT, I., AND BENTAL, A.
Citrus varieties in Israel infected with tristeza.
Ktavim, 1960, **10**: 53-8, bibl. 9, illus.

Eighteen varieties introduced from countries in which the disease is present were shown to be infected. The apparent failure, however, of the tristeza virus to spread to Eureka, Shamouti, Meiwa and Marumi trees suggests the possible absence of an efficient insect vector in this region. Indications were found that some of the tristeza-infected trees are also carriers of xyloporosis. [From authors' summary. See also *H.A.*, 31: 1300.]—Agric. Res. Stat., Beit Dagan-Rehovot.

3141. VARMA, P. M., RAO, D. G., AND VASUDEVA, R. S.
Additional vectors of tristeza disease of citrus in India.
Curr. Sci., 1960, **29**: 359, bibl. 15.

Aphis gossypii and *Myzus persicae*.

3142. MCCLEAN, A. P. D.
Seedling-yellows in South African citrus trees.
[French and Afrikaans summaries 1½ pp. each.]
S. Afr. J. agric. Sci., 1960, **3**: 259-79, bibl. 8, illus.

Seedling-yellows of sour orange and lemon and vein clearing and vascular pitting in limes are all considered to be types of reaction to the tristeza complex and transmissible by *Toxoptera citricidus*. Spraying with insecticides in the nursery is recommended.—Div. Plant Path., Pretoria.

3143. GRANT, T. J., GRIMM, G. R., AND NORMAN, P.
Symptoms of cachexia in Orlando tangelo, none in sweet lime and false symptoms associated with purple scale infestations.
Plant Dis. Reptr, 1959, **43**: 1277-9, bibl. 12.

In the present study buds from seven widely separated sources of bud inoculum produced definite cachexia symptoms in Orlando tangelo and no symptoms of xyloporosis in sweet lime seedling plants. Inner-bark injury associated with presence of heavy purple scale infestations on the bark surface produced cachexia-like symptoms in Orlando tangelo, sweet lime and Key lime plants. [From authors' abstract.]—U.S.D.A., Orlando, Fla.

3144. Olson, E. O.
Xyloporosis (cachexia or fovea) disease of Murcott honey "orange" in Texas.
J. Rio Grande Valley hort. Soc., 1960, **14**: 26-8, bibl. 3.

Fovea symptoms occurred on a nucellar tree bud-inoculated with xyloporosis (cachexia) virus, thus indicating that the diseases have the same cause.—U.S.D.A. and Tex. agric. Exp. Stat., Weslaco.

3145. Durbin, R. D.
The possible relationship between *Aspergillus flavus* and albinism in citrus.
Plant Dis. Reptr, 1959, **43**: 922-3, bibl. 6, illus.

Strains of *Aspergillus flavus* were inoculated into surface-sterilized seeds of sweet orange and grapefruit, which on germination produced albino seedlings. It is considered that the fungus produces a metabolite which is taken up by the germinating seed and inhibits chlorophyll biosynthesis.—Univ. Minn.

3146. Calavan, E. C.
Black spot of citrus.
Calif. Citrogr., 1960, **46**: 4, 18, 22-4, bibl. 12, illus., and *Citrus Gr*, 1960, No. 323, pp. 11-15.

Symptoms, hosts, infection and methods of spread of this disease, caused by *Phoma citricarpa* [*Guignardia citricarpa*], are described. In South Africa control is obtained by 3 sprays of copper oxychloride (1 lb. 14 oz./100 gal.) or bordeaux (2·5 lb. copper sulphate plus 1¼ lb. hydrated spray lime). Improved control is obtained by adding ½ gal. white spray oil/100 gal. spray to the second and third sprays. In Australia 4 sprays are sometimes applied. Additional measures on trees of poor vigour include pruning, early harvest and post-harvest storage below 70° F. Heavy coatings of wax or extremely high R.H. have some inhibitory effect on post-harvest lesion development.

3147. Schüepp, H.
Untersuchungen über *Guignardia citricarpa* Kiely, den Erreger der Schwarzflecken-krankheit auf *Citrus*. (**Investigations on *Guignardia citricarpa*, the cause of black spot disease of citrus.**) [English summary 17 lines.]
Phytopath. Z., 1961, **40**: 258-71, bibl. 21, illus.

The mycelium may be found in the leaves, petioles, fruits, fruit stalks, twigs and flowers. Cultural experiments showed that growth of the fungus is reduced if the pH falls below 5·5 and ceases altogether below pH 2·5. The action of copper sprays in controlling the disease seems to lie in inhibiting the expression of symptoms rather than in preventing infection.—Pretoria Univ.

3148. Tomta, E., Ukawa, I., and Ōgaki, C.
Practical studies on the control of melanose of Unshiu orange. Method of control and combination of some chemical sprays. [Japanese, with English summary ⅓ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1960, No. 8, pp. 11-15, bibl. 5.

Partial control was obtained with 0·4% bordeaux mixture, but removal of dead branches was equally effective. Infection occurred mainly in June, and sprays of bordeaux, lime-sulphur plus PCP, and lime-sulphur alone were not effective when applied before the time of bud burst (late March—early April).

3149. Chorin, M.
Grapefruit branches affected by galls associated with *Phomopsis* sp.
Ktavim, 1960, **10**: 97-8, bibl. 6, illus.

The disease is described; no control measures are suggested.

3150. Sleeth, B., and Dean, H. A.
Greening of mature grapefruit.
J. Rio Grande Valley hort. Soc., 1960, **14**: 85-7, bibl. 2.

Greening is caused by a fungus similar to *Leptothyrium pomi*. For control zineb sprays were more effective than either Thylate or maneb.—Tex. agric. Exp. Stat., Weslaco.

3151. M—, G.
Il marciume radicale degli agrumi. (**Root rot of citrus.**)
Tecn. agric., 1960, **12**: 69-72, illus.

The physiological form of the disease and the parasitic forms (caused mainly by *Armillaria mellea*, *Rosellinia necatrix* and *Phytophthora parasitica*) are both favoured by poor drainage. The parasitic forms can be controlled by injecting carbon disulphide into the soil at intervals of 6 months, exposing the upper part of the root system during the treatments. Diseased roots are cut out and the wounds disinfected with 1% potassium permanganate. Soil liming and the application of nitrate fertilizers are important subsidiary measures. In an additional treatment for control of *P. parasitica* and *P. citrophthora* the trunk base is treated with 2% bordeaux mixture and the diseased bark removed, the exposed wood being treated with 1% potassium permanganate.

3152. Mathews, W. D.
Footrot—a major cause of citrus tree decline.
Citrus Ind., 1960, **41**(9): 18-19.

Prevention and control of foot rot caused by *Phytophthora parasitica* and *P. citrophthora*.

3153. Klotz, L. J., Wong, P.-P., and DeWolfe, T. A.
Survey of irrigation water for the presence of *Phytophthora* spp. pathogenic to citrus.
Plant Dis. Reptr, 1959, **43**: 830-2, bibl. 9.

For another account, see *H.A.*, 30: 1162.

3154. Stolzy, L. H., and others.
Growth rates of orange seedlings in the presence and absence of *Phytophthora* spp. at two levels of irrigation and two levels of soil nitrogen.
Plant Dis. Reptr, 1959, **43**: 1169-73, bibl. 4, illus.

The presence of *Phytophthora citrophthora* and *P. parasitica* in the soil significantly reduced length and weight of shoot growth and girths of orange seedlings in pots. The effects of *Phytophthora* were much less on the autumn flush of growth in the second growing year than on earlier growth. Root quantities were also significantly reduced in soil columns containing *Phytophthora.* Top and root growth of citrus seedlings in infected soil was not significantly affected by soil applications of N (as calcium nitrate) in comparison with no N. [For irrigation results, see *H.A.*, 30: 6023.]—Univ. Calif., Riverside.

3155. Klotz, L. J., and others.
Heat treatments to destroy fungi in infected citrus seeds.
Calif. Citrogr., 1960, **46**: 63-4, bibl. 10.

Immersion of seeds in hot water (125° F.) for 10 min. is recommended for the elimination of *Phytophthora citrophthora* and *P. parasitica* without impairing germination. After drying and dusting with Arasan, they should be stored in polythene bags at 40°–45° F. [See also *H.A.*, 29: 812.]

3156. Klotz, L. J.
Grove treatments to control brown rot of fruit.
Calif. Citrogr., 1960, **45**: 414-15, bibl. 4.

Control of the disease on citrus, which is mostly caused by *Phytophthora citrophthora* but also by *P. hibernalis*, *P. syringae* and *P. parasitica*, may be obtained by spraying with: (1) bordeaux mixture containing 3 lb. powdered copper sulphate ($CuSO_4\,5H_2O$) plus hydrated lime 4½ lb./100 gal.; (2) zinc sulphate monohydrate (3 lb.), or zinc sulphate heptahydrate (5 lb.), plus copper sulphate (2 lb.), plus hydrated lime (6 lb.)/100 gal., or (3) any proprietary copper fungicide giving ¾ lb. Cu/100 gal. On areas where damage has occurred by using copper sprays Captan-50 (2 lb.) or Captan 85 W. (1 lb. 2 oz.)/100 gal. may be used, making 2 applications.—Univ. Calif., Riverside.

3157. Tsao, P. H., and Van Gundy, S. D.
Effect of soil temperature on pathogenesis of *Thielaviopsis basicola* on sweet orange roots.
From abstr. in *Phytopathology*, 1960, **50**: 657.

Root infection of seedlings was most severe at soil temperatures below optimum for the growth of both pathogen and host. The optimal temperature range for *in vitro* growth of the fungus was 21–27° C. In repeated glasshouse experiments in controlled soil-temperature tanks the optimum growth for seedlings in uninfested soils occurred at 30° C., and the growth of seedlings in soils of pH 5·8–6·0 artificially infested with the fungus was reduced by 89–95% at 15° and 20° C., by 83–85% at 25° C. and by 34–36% at 30° C. Soil surveys showed that the fungus was present in the majority of California citrus soils. Records indicated that soil temperatures in these areas were within the optimal range for the disease in November–April and above the optimum in the other months.

Citrus—pests.

(*See also* 2176, 3088, 3143, 3583, 3602.)

3158. Ford, H. W., Feder, W. A., and Hutchins, P. C.
Citrus varieties, hybrids, species and relatives evaluated for resistance to the burrowing nematode, *Radopholus similis.*
Mimeo Ser. Fla Citrus Exp. Stat. **60-13,** 1960, pp. 26.

Several hundred seedlings of many citrus types were planted in tanks containing soil infested with nematodes, and 6 weeks to 3 months later they were evaluated for vegetative vigour, appearance of root system, severity of nematode lesions on the feeder roots and the number of *R. similis* in the roots. The few that showed little or no growth depression are being evaluated as rootstocks in infested and non-infested groves. [See also *H.A.*, 29: 858i.]

3159. Tarjan, A. C.
Some effects of African marigold on the citrus burrowing nematode, *Radopholus similis.*
Abstr. in *Phytopathology*, 1960, **50**: 577.

In 4 greenhouse tests burrowing-nematode-infected grapefruit seedlings were interplanted with seedlings of African marigold, *Tagetes erecta.* In 3 of the 4 tests there were substantially fewer nematodes in the soil 2½–6 months later than in soil containing infected seedlings but no marigolds. In only 2 of the tests, however, were numbers of nematodes in roots of citrus reduced by interplanting with marigolds. A fifth test used 3 boxes 4 × 1 × 2 ft. filled with autoclaved soil. In these 12 uninfected grapefruit seedlings and 12 nematode-infected seedlings at opposite ends were separated by a zone 1 × 1½ ft. containing established marigold seedlings. After 8 months nematodes from the infected citrus had passed through the barrier of marigold roots and penetrated roots of the previously healthy citrus. In a field test involving two 4-tree blocks of mature orange trees and 2 of grapefruit trees, each block 50 × 50 ft., 1 block of each citrus species was seeded with marigold. Twenty-five citrus root and soil samples were taken from each block 3 and 5 months after seeding, and 25 root samples were taken from each 7 months after seeding. There was no significant reduction of nematode population due to the presence of marigolds in any of the blocks.

3160. Mankau, R., and Clark, O. F.
Nematode-trapping fungi in southern California citrus soils.
Plant Dis. Reptr, 1959, **43**: 968-9, bibl. 3.

A preliminary survey of types and distribution of predacious hyphomycetes associated with *Tylenchulus semipenetrans*.

3161. Martin, J. P.
Fungi and nematodes in South African citrus orchard soils in relation to the citrus replant problem.
Proc. Soil Sci. Soc. Amer., 1960, **24**: 469-72, bibl. 35, illus.

Several fungal species, including *Trichoderma viride*, that were dominant in virgin soils, were present in much smaller numbers in adjacent citrus soils. *Phytophthora* spp. present in some of the citrus soils were absent from virgin soils. The nematode *Tylenchulus semipenetrans*, found in almost all the old citrus soils, was not detected in the virgin soils. The citrus replant problem appeared to be less severe in well-drained, acid, sandy soils containing a relatively high population of *Trichoderma viride*.—Univ. Calif., Riverside.

3162. Baines, R. C., and others.
Controlling citrus nematodes in established orchards.
Calif. Citrogr., 1960, **45**: 389, 400-6.

Increased yields were obtained in 3 tests on lemon trees by the use of DPCB (Nemagon) (5 gal./acre). It is recommended, however, that DBCP should be used only on sands (3–4 gal./acre) or sandy loams (5–10 gal./acre) and should be applied by the injection method or in water 5–6 in. deep in basins. Its use is not yet recommended for soils containing over 18% of clay.—Univ. Calif., Riverside.

3163. Anon.
Blossom sprays increase Navel orange yields 20 per cent.
J. Dep. Agric. S. Aust., 1960, **64**: 41.

Consistent yield increases were obtained by spraying with 0·1% malathion at the early blossom stage to control thrips, mealy bugs and the light brown apple moth.

3164. Whitnall, A. B. M.
Experiment in ant control in citrus orchards.
Citrus Gr, 1960, No. 322, pp. 9-11.

Effective control of the small brown house ant (*Pheidole megacephala*) may be obtained for at least a year by applying Kynadrin w.p. (50% dieldrin) 8 lb./100 gal. at the rate of ½ gal./tree. The pugnacious ant (*Anaplolepis custodiens*) is less easy to eradicate and spot applications of parathion at the nest exits are recommended.

3165. Liu, S. K.
Life history and control of the citrus leaf roller (*Adoxophyes cyrtosema* Meyr,) in Canton, China. [Chinese, with English summary 1⅔ pp.]
Acta ent. sin., 1958, **8**: 293-316, bibl. 28, illus.

The recommended control programme consists of: winter eradication of weeds which might harbour larvae and pupae; hand picking of egg-masses; spraying every 5 days in April and May with a mixture of 0·06% BHC and 0·1% DDT emulsion or 0·05% E605; light traps during flowering and fruiting; and the selection of inter-row crops which are not hosts for the larvae.—S. China agric. Coll.

3166. Knorr, L. C., Webster, B. N., and Malaguti, G.
Injuries in citrus attributed to brevipalpus mites, including brevipalpus gall, a newly reported disorder in sour-orange seedlings.
FAO Plant Prot. Bull., 1960, **8**: 141-9, bibl. 18, illus.

Literature concerning the brevipalpus mites is reviewed. The formation of galls on sour orange seedlings, which cause the decline and eventually the death of the plant, is discussed. Wettable sulphur (5–10 lb./100 gal.) as a single spray effectively controlled the mites.

3167. Fochessati, A. P.
Citrus red mite infestations and methods of treatment.
Citrus Gr, 1960, No. 321, pp. 7, 9, illus.

The life history and injury caused by *Panonychus citri* are described. Control measures include systemic poisons applied as single foliar sprays, oil emulsions (1–1½ gal./100 gal.) applied at the beginning of infestation and the use of acaricides, such as Kelthane, Spinnex (Tedion V 18) or Ovotran, all of which have long residual effects. Spinnex is effective without the addition of other materials such as parathion, thus leaving beneficial insects unharmed.—Kynoch Ltd., Nelspruit.

3168. Thomas, H. A.
Chemical spray trials for the control of mites on citrus.
J. Rio Grande Valley hort. Soc., 1960, **14**: 33-9, bibl. 2.

Zineb was the most effective spray for citrus rust mite control, a 0·8% combination of spray oil and zineb showing slightly greater persistence than zineb alone. Kepone and maneb were also promising. Tedion used for Texas mite control did not appear to kill certain beneficial mites, and satisfactory results against this mite were also obtained with Ortho Mitox and Crag Glyodin.—Tex. agric. Exp. Stat., Weslaco.

3169. SALAZAR, J., AND GAMERO DE LA TORRE, O.
Ensayos de control del acaro de la herrumbre de los cítricos *Phyllocoptes oleivorus* Ashm. (Eriophyidae). **(Experiments on control of the citrus rust mite, *Phyllocoptruta oleivora*.)**
Inf. Mens La Molina, 1959, **33**(382): 9-13, and *Bol. trim. Exp. agropec. P.C.E.A., Lima*, 1960, **9**(2): 8-11.

Full control of the adults for 4 weeks was given by Dithane Z-78, Trithion, Kelthane, chlorobenzylate, Thiovit (micronized sulphur) and Lonacol (zineb). Poor results were given by Metasystox and Ekatin. The action of Tedion against the adult mites was only slight, but it was effective against the eggs and larvae.

3170. DEAN, H. A., AND BAILEY, J. C.
Introduction of beneficial insects for the control of citrus scale insects and mites.
J. Rio Grande Valley hort. Soc., 1960, **14**: 40-6, bibl. 12.

Of the 17 species of parasites and predators introduced into the lower Rio Grande Valley area in the past 8 years, *Aphytis lepidosaphes* has reduced the purple scale (*Lepidosaphes beckii*) to the status of a minor pest and *Aphytis lingnanensis* has given indications of successful establishment and of the possible control of the Florida red scale (*Chrysomphalus aonidum*).—Tex. agric. Exp. Stat., Weslaco.

3171. (DEBACH, P.)
Wasp fighting citrus pest.
West. Fruit Gr, 1960, **14**(9): 28.

Promising results in the control of red scale by the release of the wasp *Aphytis melinus* are reported.

3172. CANGARDEL, H.
Essais de differents traitements sur le "pou rouge de Californie" (*Aonidiella aurantii* Mask.). **(Experiments on red scale control by different treatments.)**
Cahiers Rech. agron., 1960, No. 10, pp. 69-77, illus.

For orange trees fumigation with HCN (6 g./cu. m.) proved most effective; second best was spraying with wettable parathion in kerosene. Fumigation trials are being continued.—Serv. Rech. agron., Rabat.

3173. LAVILLE, E.
Pénétration et localisation d'une huile de paraffine dans l'écorce d'orange. **(The penetration and distribution of paraffin oil in orange peel.)** [English, German, Russian and Spanish summaries, 9-11 lines each.]
Fruits d'Outre Mer, 1960, **15**: 357-60, bibl. 2, illus.

Histological examination indicated that the greater part of the applied paraffin oil remained in the external mesocarp and was located entirely in the intercellular spaces, not penetrating the cells.—I.F.A.C.

Citrus—fruit harvesting, packing, storage and by-products.

(*See also* 3088, 3146, 3559, 3602.)

3174. TROUT, S. A., HEULIN, J. E., AND TINDALE, G. B.
Respiration of Washington Navel and Valencia oranges.
Tech. Pap. Food Pres. Transp. Div. C.S.I.R.O. Aust. **14**, 1960, pp. 11, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-176.

The respiratory drift of fruit from 3 coastal and 4 inland irrigated districts was measured after harvesting. In most cases a climacteric rise occurred as the oranges approached commercial maturity. Fruit picked a little before maturity was already in the climacteric and passed through a respiration maximum; subsequent pickings were in the post-climacteric phase. Fruits affected by cold injury tended to give irregular curves. Oranges did not show the close correlation between the climacteric and other senescent changes characteristic of some other fruits.

3175. SOLOMON, D.
The advantages of bulk handling of citrus from orchard to packhouse.
Citrus Gr, 1960, No. 318, pp. 7, 9, 11, illus.

The use of specially designed trailers with detachable steel containers, each holding 5,200 lb. of fruit, has reduced harvesting costs at Crocodile Valley to the equivalent of 3½d. per field box. Advantages of this method of bulk handling include a reduction of the labour force, dispensing with field boxes, a 35% reduction in transport and the replacement of heavy lorries by tractors which can be used for other work during the remainder of the year. The equipment cost no more than that needed for a transport system of heavy lorries and field boxes. The method of operation, including the use of electric hoists, and the question of fruit injury, including oleocellosis damage, are discussed.

3176. SMITH, R. J.
Bulk handling at Sebediela.
Calif. Citrogr., 1961, **46**: 66, 73, illus.

Rubber lined, 4-wheel trailers with 2 hinged gates in the bottom deliver directly into a water tank. The water contains chlorine (100–125 p.p.m.) and is circulated so as to carry the fruit forward for washing and waxing.

3177. (CREEKS, C.)
Bins cut costs in Tulare citrus houses.
West. Fruit Gr, 1960, **14**(6): 49-50, illus.

A combination of an agricultural trailer fitted with roller conveyors on the floor and wire-bound wooden bins, each 48 × 48 × 31 in., double stacked by fork lift.

3178. CAPEL, G. L.
Comparative costs of alternative methods for performing certain handling operations in Florida citrus packinghouses.
Bull. Fla agric. Exp. Stats **609**, 1959, pp. 69, bibl. 13, illus.

Data are presented on unloading and storing $1\frac{3}{8}$-bushel wire-bound box materials, assembling and supplying these to the packers and closing, transporting and loading them. Similar studies were made on closing, transporting and loading $1\frac{3}{4}$-bushel standard nailed boxes, transporting and loading 8-lb. bags and handling fibreboard boxes.

3179. THOR, E.
Economies of scale in the operation of Florida citrus packinghouses.
Bull. Fla agric. Exp. Stats **606**, 1959, pp. 39.

Operating costs are analysed in relation to different scales of operation, and suggestions are made for long-term economies, including improvements of conventional field box dumping methods and dividing very large packing houses into two units.

3180. HINDS, R. H., JR.
A better way to load citrus.
Agric. Mktg, 1960, **5**(10): 13-14, illus.

A stacking pattern for trucks is described and illustrated, which allows cool air to zigzag through all parts of a load of $\frac{4}{5}$-bushel fibreboard containers.

3181. HARDING, P. R., JR.
Relative humidity in citrus cartons as influenced by external temperature and relative humidity.
Plant Dis. Reptr, 1959, **43**: 893-7, bibl. 4.

The R.H. within citrus cartons was reduced when they were moved to a place where the temperature was considerably lower than that of the contents, and where the vapour pressure was similar or lower. In general, the R.H. changed more rapidly in vented than in non-vented cartons. After the initial drop in R.H. on transference to a lower temperature there was a rise in R.H., which would be sufficiently high for the release of ammonia from moisture-sensitive sheets used to control citrus blue and green moulds.

3182. DAVIS, P. L., AND SMOOT, J. J.
Effect of polyethylene and wax coatings, with and without fungicides, on rind breakdown and decay in citrus.
Citrus Ind., 1960, **41**(11): 6-7, 9, bibl. 8.

Coating Marsh grapefruit and Pineapple and Valencia oranges with polythene or wax emulsions reduced the incidence of rind breakdown during 7 weeks' storage at 40° F. Sodium orthophenylphenate and hexamine or propynyl N-phenylcarbamate incorporated in the coating reduced decay during a 7-day period at 70° F. after removal from store, but slightly increased the incidence of rind breakdown during storage. [See also *H.A.*, 30: 6043.]

3183. THODE, W.
Retention of *o*-phenylphenol in peel of stored oranges.
Dtsch. LebensmittRdsch., 1960, **56**: 46-9, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-33.

Fruit dipped in 0·5–2·0% solutions of sodium *o*-phenylphenate remained sound for up to 9 weeks. The amount of preservative penetrating into the pulp varied from 0 to 0·7 p.p.m. Storage in wrappers impregnated with *o*-phenylphenol resulted in skin damage and in residues in the pulp of up to 22 p.p.m.

3184. MOREAU, C.
La "moisissure grise" des oranges. (**Grey mould of oranges.**)
Fruits et Prim., 1960, **30**: 135, bibl. 3.

Botrytis cinerea has recently been found to be a primary agent of rot in Algerian oranges. Brief notes are given on symptoms, the environmental conditions favouring development and control measures (reduction of humidity, increase of ventilation and regular disinfection of the air in stores; and spraying the trees before harvesting with dithiocarbamate fungicides).

3185. TAMBURINO, S. M., AND OTHERS.
Sulla conservazione di arance mediante irradiazione con raggi gamma del Co_{60}. (**Orange storage by means of CO^{60} gamma irradiation.**)
Tecn. agric., 1959, **11**: 631-5, bibl. 1.

When Sanguinello oranges, previously inoculated with green mould (*Penicillium digitatum*), were exposed to radiation (330,000 r) for 37 hours and then stored in warm (21° C.), humid conditions, they remained in good condition for 7 days compared with only 1 day in the non-irradiated controls. Inoculated Sanguinello oranges exposed to 150,000 r for the same period and then stored at 3° C. remained in good condition for 62 days compared with 14 in the control.—Univ. Catania.

3186. HARDING, P. R., JR.
Biphenyl-induced variations in citrus blue mold.
Plant Dis. Reptr, 1959, **43**: 649-53, bibl. 4, illus.

Strains of *Penicillium digitatum* developed resistance to biphenyl when exposed to high concentrations. Some cases of acquired resistance were permanent, and are considered to be genetical changes, while others were only temporary.—U.S.D.A., Pomona, Calif.

3187. Eckert, J. W., and Kolbezen, M. J.
Evaluation of ammonia-generating formulations for control of citrus fruit decay.
From abstr. in *Phytopathology*, 1960, **50**: 634.

Six ammonia-generating formulations were evaluated for the control of orange decay caused by *Penicillium digitatum* in closed fibreboard containers. In order of decreasing effectiveness, the systems tested were: $(NH_4)_2SO_4$-$Ca(OH)_2$-impregnated sheets; $(NH_4)_2$ SO_4-Na_2 CO_3-impregnated sheets; $MgCl_2.2NH_3$-$(NH_4)_2$ SO_4-Na_2 CO_3 tablet mats; NH_4HCO_3 tablet mats; diammonium succinate tablet mats; $(NH_4)_2$ SO_4-Na_2 CO_3 tablet mats. Both sheet formulations and the $MgCl_2.2NH_3$ tablet mats evolved relatively large quantities of ammonia at 85% R.H., whereas the three remaining tablet formulations had higher humidity requirements. In tests with artificially inoculated fruit all formulations provided better decay control in fruit near the centre of the carton than closer to the carton walls. The distribution of ammonia in cartons containing a tablet formulation was poor compared to those with either of the sheet formulations.

3188. Kolbezen, M. J., Wilson, C. W., and Eckert, J. W.
The automatic measurement of fumigant concentrations.
From abstr. in *Phytopathology*, 1960, **50**: 642.

Apparatus has been developed which will allow sampling of the ammonia evolved by in-carton fumigation of citrus. A 30-ml. sample is withdrawn into a 10-cm. spectrophotometer cell and the ammonia concentration recorded as a fraction of absorbance. The sample is then returned to its original site. Fruit effluent causes no interference.

3189. Withers, R. B.
Fruit fly—good prospect of success of EDB sterilisation if cause of fumigant loss in chambers is found.
Citrus News, 1960, **36**: 71, 74.

Results of fumigation of infested oranges at 60, 50 and 45° F. suggested that, while no more EDB was required in the juice at these temperatures than at 70° F., a larger dose of EDB was required at lower temperatures for a given uptake by the juice. It was difficult to obtain satisfactory levels of EDB in the air and juice in a plastic tent at temperatures below 70° F. Dipping infested fruit in an EDB emulsion (1, 2 or 3 g./l.) produced 100% larval mortality, though the residue of EDB in the juice was only 1·0 p.p.m. High mortality was also obtained by dipping in systemic organic phosphate insecticides. [See also *H.A.*, 29: 3995.]

3190. Neumark, H., and Aspridis, J.
Note on the effect of metabisulphite on the sugar content of ensiled orange peel.
Emp. J. exp. Agric., 1961, **29**: 49-50, bibl. 13.

The addition of 0·5% metabisulphite when preparing this form of cattle food markedly increased its sugar content and helped to retain the disaccharides.—Agric. Res. Stat., Beit-Dagon, Israel.

Dates.

3191. de Fontenay, U., and de Fontenay, V. J.
Date growing in Australia.
J. Aust. Inst. agric. Sci., 1960, **26**: 246-57, bibl. 28, illus.

Date culture generally, botanical features, and climatic and other requirements, including temperature and the rain tolerance of varieties.

3192. Péreau-Leroy, P.
Le palmier dattier au Maroc. **(Date palms in Morocco.)**
Inst. franç. Rech. fruit. Outre-Mer, 1958, 9 × 7 in., pp. 142, bibl. 27, illus.

The 5 chapters deal with economics, cultural practices, diseases, pests and varieties.

3193. Ahmad, M., and Ali, N.
Effect of different pollens on the physical and chemical characters and ripening of date fruit.
Punjab Fruit J., 1960, **23**(80): 10-11.

Pollen was used from *Phoenix dactylifera*, *P. sylvestris*, *P. canariensis* and *P. humilis*. Fruits from trees pollinated with *P. humilis* ripened a fortnight earlier; although they were smaller in size, diameter and stone that the others, the percentage of edible matter was greater than in all but the *P. dactylifera*-pollinated fruits.

3194. Harding, P. R., Jr.
The preharvest shrivel disease of dates.
Plant Dis. Reptr, 1959, **43**: 962-3, bibl. 4, illus.

Of the several species of fungi isolated from inflorescence strands bearing shrivelled dates none was found capable of infecting healthy inflorescence strands either in petri dishes of agar or on the trees. Since no bacteria have been found definitely associated with the disease, it seems likely that the disease is not of fungal or bacterial nature. [Author's summary.]—U.S.D.A., Pomona, Calif.

3195. Stallings, D. G.
Marketing domestic dates. Packinghouse practices and costs.
Mktg Res. Rep. U.S. Dep. Agric. **373**, 1959, pp. 19, bibl. 12.

Including types and sizes of package.

Olives.

(*See also* 2294.)

3196. Ferrara, A.
Olivo e olio di oliva nel mondo. **(Olive trees and olive oil throughout the world.)**
Olearia, 1958, **12**: 103-16, illus.

Production and trade.

3197. DEL CAMPO, E.
Olivos en Colombia. (Segunda parte.) **(Olives in Colombia. Part 2.)**
Bol. Oleic. int., 1960, **10**(56): 3-19, bibl. 3, illus.

In this part the physical features of potential olive-producing areas are described. [For part I, see *H.A.*, 30: 1196.]

3198. ARMELLINI, S.
L'Ascolana tenera Valle Fiorana, clone 50, pregevole oliva da tavola. **(The choice table olive Valle Fiorana, clone 50, of the Ascolana tenera group.)**
Inf. Ortofruttic., 1960, **1**: 74-5, illus.

Not only of exceptional table quality, but yields 16–17% of highest grade oil.

3199. NORO, K.
Effect of tetraploid Mission olive seedling as a stock on the growth of the Mission olive tree. [Japanese, with English summary ½ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **10**: 8-13, bibl. 16, illus.

Cytological examinations of vigorous, large-leaved and dwarf, small-leaved strains suggest that the use of polyploid stocks may cause dwarfing.

3200. BOUAT, A.
Fertilization of the olive tree.
Fertilité, 1960, No. 10, pp. 13-25, bibl. 3, illus.

The N, P, K and Ca requirements of olive trees are given on the basis of trials in widespread areas of France and Tunisia. Quantities, types and times of application are detailed.

3201. PRÉVOT, P., AND BUCHMANN, B.
Foliar diagnosis of irrigated olive trees. Evolution of concentrations in the course of the year.
Fertilité, 1960, No. 10, pp. 3-11, bibl. 3.

A comparison of the concentrations of N, P, K, Ca and Mg in the leaves of olive trees in France and Tunisia showed very similar figures for critical levels, except for the figures for K which were over 50% higher in Tunisia. It is considered that K deficiency is widespread in French olive groves. Numerous data on crop levels and foliar diagnosis are given. [See also *H.A.*, 29: 2899.]

3202. HARTMANN, H. T., OPITZ, K., AND HOFFMAN, R. M.
Pruning olives in California.
Bull. Calif. agric. Exp. Stat. **771**, 1960, pp. 30, bibl. 12, illus.

The results of numerous experiments on pruning both young and bearing olive trees are reviewed and their practical implications discussed.

3203. R—, A.
La rogna dell'olivo. **(Bacterial knot of olive trees.)**
Tecn. agric., 1959, **11**: 636-9, illus.

Preventive treatments against *Pseudomonas* spp. should be applied, especially immediately after wounding. The most effective product is 1% bordeaux mixture. Pruning tools should be disinfected after every contact with diseased shoots.—Ist. Pat. veg., Univ. Catania.

3204. A—, N.
Su alcuni insetti dannosi all'olivo. **(Some insect pests of olives.)**
Tecn. agric., 1960, **12**: 73-7, illus.

The larvae of the moth *Margaronia unionalis* were effectively controlled by 1% sprays of commercial lead arsenate, but parathion gave poor results. Soil treatment with powdered aldrin, dieldrin, heptachlor or BHC is advised against the beetles *Otiorrhynchus meridionalis* and *O. cribricollis.* The beetle *Sterionychus* (*Cionus*) *fraxini* is easily controlled by spraying the olive foliage, particularly the lower leaf surfaces, with lead arsenate.

3205. MICHAELIDES, R. C.
The olive fly.
Countryman, Nicosia, 1960, July-August, pp. 4-5, 8, bibl. 12.

Dacus oleae was controlled by Rogor 40 and the insecticidal effect persisted for 30 days.

3206. HUFFAKER, C. B., AND KENNETT, C. E.
Imported parasitic wasps show control of olive scale with increasing effectiveness.
Calif. Agric., 1960, **14**(12): 4-8, illus.

Studies in commercial groves on the parasitism of *Parlatoria oleae* by *Aphytis maculicornis* showed that 2 years after the parasites were released scale populations were reduced or remained about the same level. In groves where parasites were deliberately destroyed, scale populations increased markedly. The trees where the scale was being controlled biologically produced 2% cull fruit, whereas culls from trees with no parasites reach 79 to 100%. Parasitism was hampered by spray drift. Regular pruning will help the establishment of parasites. Successful biological control has been achieved in groves under gravity flow and sprinkler irrigation systems.—Univ. Calif., Berkeley.

3207. MATSUZAWA, H., AND OTHERS.
Studies on the control of the olive weevil, *Hylobius desbrochersi*. IV. On the longevity and the fecundity of the adult weevil. V. Synecological study of the olive weevil. VI. On the control of the weevil. [Japanese, with English summaries.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **10**: 36-9, bibl. 7, **11**: 187-95, bibl. 9, and 196-205, bibl. 9.

Adult weevils lived on average for 600–700 days. Few eggs were laid in the weevil's first year, but 70–80 were laid in each of the second and third years. Part V is a population study of numbers and distribution in the orchard. Part VI reports that chlorinated hydrocarbons, such as BHC, endrin, aldrin and nicotine-DDT, mixed in sticky trunk bands or dusted onto such bands were effective and persistent. Phosphorus compounds were also effective but more hazardous.

3208. Pisani, P.
Facilitata la raccolta delle olive. (**Olive harvesting simplified.**)
Frutticoltura, 1960, **22**: 549-54, bibl. 7, illus.

The simple and highly effective tool described is constructed like a pair of secateurs, but instead of short blades there are 2 longer, curved plastic combs with stout, blunt teeth. The olives are stripped off the branches, and the twigs and leaves pass relatively unharmed between the teeth. On an equal time basis, the yield from a test was 71·5% higher than by ordinary hand stripping. A more complex apparatus, designed for stripping either high or low branches, has its operative tip formed from 2 comb-like valves forming a cavity which leads into a long, tubular, plastic bag. For high work the tube is made rigid by locking the sections of a collapsible rod with a device for controlling the opening and closing of the valves from below. This apparatus, particularly with the tube extended, gave unsatisfactory results (only 38·3 and 62·1% of the hand-stripping yield with and without the extension rod.)—Ist. Colt. arb., Univ. Bologna.

3209. Coppa-Zuccari, G.
L'huilerie d'olives à la foire de Bari. (**Olive oil production at the Bari Fair.**)
Oléagineux, 1961, **16**: 17-25, illus.

The article includes brief descriptions of apparatus and machinery for stripping olives from high branches and for sweeping fallen olives from the ground. [A comb-and-tube hand tool is that mentioned in the previous abstract.]. One sweeper resembles a motor lawn mower and has plastic blades, the other is a motorized suction apparatus which separates the olives from stones and other débris. The oil-extracting machine described permits drying of the pulp during extraction, without the necessity of stopping at intervals; the spent pulp is automatically discharged. Various aspects of extracting and bottling the oil are also briefly reported.

3210. Bradford, E. A. M.
The Spanish olive industry.
Food, 1959, **28**: 285-8, from abstr. in *Econ. Bot.*, 1960, **14**: 156.

After harvesting the olives are soaked in 2·5% caustic soda for 14 hours, washed, covered with 8% brine and allowed to ferment in the sun for about 30 days. After inspection and grading they are stored in brine. For oil production the ripe olives are milled or crushed and the pulp pressed to extract the first-quality oil, which is filtered and marketed. Further pressing produces a second-quality oil, which is refined before marketing. Glycerine and fatty acids are also derived from the pulp.

3211. Sevastano, J.
Procedimiento de extracción por electroforesis y electro-ósmosis del aceite de oliva. (**The procedure for extracting olive oil by electrophoresis and electro-osmosis.**)
Bol. Oleic. int., 1960, **10**(56): 41-8, illus.

Passion fruit.

3212. Blacker, G. W. J.
Grafting passionfruit vines.
N.Z. J. Agric., 1960, **101**: 401-5, bibl. 2, illus.

Grafting purple passion fruit vines onto golden passion fruit rootstocks is recommended, since this stock is resistant to the *Fusarium* spp. which are thought to be involved in root and collar rot. Raising the plants, the selection of scion wood and methods of cleft and approach grafting are described.—D.S.I.R., Auckland.

3213. Western Australia Department of Agriculture, Plant Pathology Branch.
Brown spot of passion fruit.
J. Agric. W. Aust., 1960, **1**: 609-10, illus.

Symptoms and spread of the disease caused by *Alternaria passiflorae* are described. Control measures include trimming off all low-hanging growth, thinning out laterals and removing diseased growth at least once a year and spraying immediately thereafter with bordeaux 4–4–50 plus calcium caseinate. Spring spraying at monthly and summer spraying at 2-monthly intervals should also be carried out. Zineb or ziram should be used for a few weeks prior to harvesting.

Persimmons.

(*See also* 1939, 1997.)

3214. Evreinoff, V. A.
Étude pomologique sur le plaqueminier de Virginie (*Diospyros virginiana* Linné). (**A pomological study of the Virginian persimmon.**)
J. Agric. trop. Bot. appl., 1959, **6**: 574-81, bibl. 8.

The subjects discussed are geographical origin, biological characters, climatic requirements, cultural practices (multiplication by grafting on *D. lotus*, marcottage and root suckers; planting; spacing at 6× 6 or 7× 7 m.; and the lack of need for pruning, pest control and even cultivation); varieties (13 briefly described). This persimmon is considered suitable for extensive planting in the Landes and Languedoc districts of France.

3215. Schroeder, C. A.
Fruit growth in the oriental persimmon.
Yearb. Calif. Avoc. Soc., 1960, **44**: 130-3, bibl. 12.

There appear to be 2 main periods of fruit development each of about 2 months duration, and in the second month of the latter period most of the dry matter is accumulated. A sudden increase in the N content heralds horticultural maturity.—Univ. Calif., Los Angeles.

3216. TANI, T.
Enzymic degradation of kaki fruit polysaccharides by *Gloeosporium kaki*. [Japanese, with English summary ½ p.]
Tech. Bull. Fac. Agric. Kagawa, 1959, **10**: 29-35.

The enzymic substrates and the pectin, hemicellulose and cellulose of Fuyu, a susceptible variety, were almost the same as those of Goban, a resistant variety, but an inhibitor of polygalacturonase was found in Goban fruit.

3217. TARUTANI, T., AND MANABE, M.
Studies on the utilization of persimmons (*Diospyros kaki* Linn.) II. On canned dried persimmons. [Japanese, with English summary ⅓ p.].
Tech. Bull. Fac. Agric. Kagawa, 1959, **11**: 259-64, illus.
Idem. III. Effects of storage temperature on persimmons. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 114-20, bibl. 11, illus.

Trials of 18 varieties showed that Hiratanenashi was the best for canning dried because of its fine texture and heat resistant properties. Aizumishirazu, Atago and Chosenkaki were also suitable. Sun drying for 5–7 days followed by treatment at 40° C., R.H. 85% and air velocity 2 m./sec. for 2–3 days was the most successful drying method tested. A 60% sugar concentration in the canning syrup was best. Part III reports on the storage of samples of an astringent and a non-astringent variety at room temperature and at 5°, 0° and —15° C., both within and without permeable polythene bags. Both varieties kept well for a year at —15° C. but only for 1–2 months at room temperature. The polythene bags prevented shrivelling and loss of weight during 5 months' storage but had little effect on post-harvest ripening. It is suggested that —15° C. is required for the storage of astringent varieties but that 0° C. is satisfactory for the non-astringent types. [For part I, see *H.A.*, 28: 3023.]

Pomegranates.

3218. HINGORANI, M. K., AND SINGH, N. J.
***Xanthomonas punicae* sp. nov. on *Punica granatum* L.**
Indian J. agric. Sci., 1959, **29**: 45-8, bibl. 5.

Isolation of the pathogen of pomegranate bacterial leaf-spot disease.

3219. BUSTINZA, F.
Contribución al estudio de la actividad antibacteriana del jugo de la porción carnosa de las semillas de *Punica granatum* L. **(The antibacterial action of the juice from the fleshy part of pomegranate seeds.)**
An. Inst. bot. A. J. Cavanilles, 1956, **14**: 5-17, illus., [received 1961].

The juice from sweet or sour pomegranate seeds was active *in vitro* against *Eberthella typhosa* and *Shigella dysenteriae*. Numerous other bacteria, including several involved in human pathology, were inhibited by juice from the sour variety, and, in general, the more acid the juice, the greater was its effect.

Tree tomatoes.

3220. GALLEGO M., F. L.
Gusano del tomate de arbol. (Broca del tomate en el Brasil). **(The tree tomato caterpillar (tomato borer) in Brazil.)**
Rev. Fac. nac. Agron. Colombia, 1960, **20**(54): 39-43.

The larvae of the moth *Neoleucinodes elegantalis* seriously damage the fruit of tree tomatoes (*Cyphomandra betacea*) and are also pests of tomatoes and eggplants. The pest is controlled by 3 fortnightly sprays of 50% DDT at 1 lb. per 200 l. of water, beginning a week after flowering. The treatments can be conveniently combined with fungicidal sprays. Affected fruit should be collected daily and buried at least 60 cm. deep.

Tung.

3221. CHATTERJEE, S. K.
Effect of pre-sowing treatments of tung (*Aleurites fordii*, Hemsl.).
Sci. and Cult., 1960, **26**: 130-1, bibl. 3.

The treatments were soaking the seeds in certain growth substances at concentrations of 50 and 500 p.p.m. and steeping them in water at 30, 40, 50 and 60° C. for 1 and 5 minutes. At both concentrations IAA, IBA, ascorbic acid, NAA, IPA and PAA increased the percentages of germination and of healthy seedlings established, especially the first 3, whereas TCP and 2,4-D reduced them, especially at the 500 p.p.m. level. Of the steeping treatments 5 minutes at 30° and 1 minute at 40° C. were the most effective, the 60° C. treatments being deleterious.—Res. Lab., Mungpoo, Darjeeling.

3222. BARROWS, H. L., NEFF, M. S., AND GAMMON, N., JR.
Effect of soil type on mobility of zinc in the soil and on its availability from zinc sulfate to tung.
Proc. Soil Sci. Soc. Amer., 1960, **24**: 367-72, bibl. 62.

Field experiments with 1-year-old tung trees showed that the vertical movement of Zn in the soil varied markedly with the soil type. When the movement was fast, 1 oz. of Zn sulphate per tree applied to the soil surface proved toxic. When the movement was slow the trees obtained very little Zn from surface applications, but they obtained sufficient when it was mixed with the soil. Only slow lateral movement of Zn occurred, primarily towards the trees. [See also *H.A.*, 30: 1209.]—U.S.D.A., Bogalusa, La, and Cairo, Ga, and Fla agric. Exp. Stat., Gainesville.

TROPICAL FRUIT AND PLANTATION CROPS.

General.

(*See also* 2333.)

3223. COMMONWEALTH ECONOMIC COMMITTEE.
Plantation crops.
[*Publ.*] *Commonw. econ. Cttee*, 1960, pp. 220, H.M.S.O., London, 10s.

A review of world production, trade and prices of sugar, tea, coffee, cacao, spices, tobacco and rubber.

3224. MITCHELL, J. F.
Guide to chemical weed control.
[*Publ.*] *Dep. Agric. St. Vincent*, 1960, pp. 14.

Bananas: As a pre-emergence treatment diuron at 3 lb. + dalapon at 5 lb./acre is particularly recommended. *Arrowroot:* Pre-emergence applications of monuron or diuron at 1·5 lb./acre are recommended. *Lawns:* 2 to 3 applications of 2,4-D at 1 oz./gal. is said to remove *Cyperus rotundus* from savannah grass. *Cacao:* Dalapon at 5 lb./acre has proved safe; PCP in diesel oil is generally used. Notes are also given on weed control in ground provision crops, sugar cane, coffee, citrus, pineapples and coconuts. A table summarizes which of 9 herbicides may be used in each crop.—From *Weed Abstr.*, **9**, No. 963.

3225. JOHNSTON, A.
Common diseases and pests of crops in Malaya with suggestions for their control.
Bull. Dep. Agric. Malaya **110**, 1959, pp. 36, bibl. 47, illus., 2s. 4d.

Brief notes, including control measures, for numerous diseases and pests, which are tabulated separately in alphabetical order of crops.

3226. REDDY, C. S., AND DAVIDE, R. G.
Stickers for fungicidal sprays in the tropics.
Plant Dis. Reptr, 1959, **43**: 872-7.

A technique was developed for measuring the amount of spray remaining on glass slides after successive falls of artificial rain. It was found that the recommended sticker dosages were too low to be of value in the tropics. In tests natural rubber latex was shown to be the best and cheapest sticker. A synthetic latex, PEPS, was almost as good. [See also *H.A.*, 30: 4009.]—Ia St. Coll., Ames, and U.P. Coll. Agric., Los Banos.

3227. STALLWOOD, P. L.
Use of hormone herbicide for killing *Leucaena glauca*.
Papua New Guinea agric. J., 1960, **13**: 41-2.

A 0·25% solution of 2,4,5-T in kerosene or dieselene painted as a 6–8-in. band around the trunk near ground level has proved effective. The herbicide should preferably be applied when the bark is dry. This method can be used for thinning *Leucaena* shade in cacao and coffee.—Agric. Exp. Stat., Epo.

Areca palms.

3228. DAVIS, T. A.
Aerial layering in *Areca catechu*.
Arecanut J., 1960, **11**: 9-11, bibl. 9, illus.

Details of a promising method using a wooden box fixed just below the fork of a branching palm.

3229. BAVAPPA, K. V. A., AND MATHEW, T.
Effect of different spacings on the quality of arecanut seedlings.
Arecanut J., 1960, **11**: 3-8, bibl. 5, illus.

The 5 spacings tested in the nursery were 6 × 6, 9 × 9, 12 × 12, 15 × 15 and 18 × 18 inches. The best root and shoot development in the 1st year of growth was obtained with the 2 widest spacings.—Cent. Arecanut Res. Stat., Vittal.

3230. RAO, K. S. N.
Plant protection practices in arecanut.
Arecanut J., 1960, **11**: 14-16, bibl 7.

See also *H.A.*, 29: 4121.

3231. MENON, R.
Serological tests on yellow leaf disease of arecanut.
Arecanut J., 1960, **11**: 12-13, bibl. 5.

The presence of an active ribonucleoprotein in affected leaves suggests a virus is the cause.

Bananas and abaca.

(*See also* 2071, 3224, 3560, 3568, 3571, 3590.)

3232. KAY, D. E., AND SMITH, E. H. G.
A review of the market and world trade in bananas.
Trop. Sci., 1960, **2**: 154-61, bibl. 8.

Varieties, stem "counts", transport temperatures, export and import figures and world trade generally.

3233. McPaul, J. W.
Some aspects of banana cultivation in Fiji. Parts I and II.
Agric. J. Dep. Agric. Fiji, 1959, **29**: 117-31, illus., and 1960, **30**: 5-13, bibl. 6.

Part I deals with all aspects of growing the crop. In Part II it is shown that 3 acres is an economic area which a peasant farmer could maintain, capable of producing 200 cases per acre and resulting in an income of £250 per annum.

3234. Champion, J., and Moreau, B.
Culture bananière en Équateur. **(Banana cultivation in Ecuador).** [English, German, Russian and Spanish summaries 9-10 lines each.]
Fruits d'Outre Mer, 1960, **15**: 361-8, illus.

Organization, production and prospects.

3235. de Langhe, E., and Devreux, M.
Une sous-espèce nouvelle de *Musa acuminata* Colla. **(A new sub-species of *Musa acuminata*).**
Bull. Jard. bot. Bruxelles, 1960, **30**: 375-88, bibl. 9, illus.

A taxonomic study with a key to the sub-species.

3236. Berrill, F. W.
Plant growth and yield in the Cavendish banana (*Musa cavendishii* Lamb.) as affected by size and type of planting material.
Qd J. agric. Sci., 1960, **17**: 69-81, bibl. 8.

Pieces of corm 1 to 6 lb. in weight were better planting material than suckers 10 to 20 in. in girth, producing a more uniform stand of more vigorous and heavier bearing plants. Size of planting material had more effect on performance with the suckers than with the pieces of corm. The best sizes were pieces of corm weighing 2 to 4 lb. and suckers 12 in. in girth.

3237. Morez, H.
Les effets de la conservation d'une portion de faux tronc attenant aux rhizomes plantés sur la sortie et le développement des rejets (bananiers Poyo). **(The effects of retaining a portion of the pseudostem of Poyo banana plants attached to the planted rhizomes on the emergence and development of suckers.)** [English, German, Spanish and Russian summaries approx. 14 lines each.]
Fruits d'Outre Mer, 1960, **15**: 423-4, illus.

Leaving a portion of the pseudostem attached to the sett resulted in fewer, but longer and stouter, shoots with 26% more leaf surface 3 months after planting.

3238. Lifshitz, N.
Experiments in controlling annual weeds in bananas. [Hebrew.]
Allon Hanoteä, 1959, No. 7.

Sprinkler-irrigated 4–5-year-old bananas were treated with simazine, 0·5–1·5 kg./ha., neburon, 2–4 kg./ha., and diuron, 0·96–1·92 kg./ha., in December or May; the December plots were retreated with the highest rate of diuron or simazine in June. Neburon was insufficiently persistent, and diuron was better than simazine. In another trial on flood-irrigated bananas simazine gave better results than diuron. None of the treatments caused any crop injury of importance.—*Weed Abstr.*, **9**, No. 1129.

3239. Cassidy, N. G.
The maintenance of soil fertility in Fiji. 3. Banana growing and the special requirements of the banana plant.
Agric. J. Dep. Agric. Fiji., 1960, **30**: 55-60, bibl. 7.

In declining banana plantations the first deficiency to appear was that of potassium. This was followed by the dominance of Para grass, the bananas then becoming worthless.

3240. Steward, F. C., and others.
Physiological investigations on the banana plant. I. Biochemical constituents detected in the banana plant. II. Factors which affect the nitrogen compounds of the fruit.
Freiberg, S. R., and Steward, F. C.
Idem. III. Factors which affect the nitrogen compounds of the leaves.
Ann. Bot., Lond., 1960, **24**: 83-116, bibl. 81; 117-46, bibl. 9; and 147-57, bibl. 17.

The nitrogenous constituents of alcohol-soluble extracts of leaf, fruit and stem of Gros Michel bananas were examined. In particular, amino-acids and their amides, certain volatile amines, ureido and guanido compounds, indole compounds, keto acids and non-volatile organic acids were detected and estimated. The second paper describes a study of ripening and the distribution of N compounds within the fruit. The variation among different cultivars was less than that within Gros Michel grown under different conditions. Winter growth resulted in a low, summer in a high, amide condition. The third part describes leaf extracts from plants grown in sand culture and irrigated with full nutrient and with K-, Mg-, P- and Ca-deficient solutions. Leaves and fruits differed in amino-acid composition, and young leaves differed from old leaves in their more active accumulation of soluble N. Imbalance of K, Mg and P had marked effects on N metabolism. In K-deficient leaves protein synthesis was arrested and breakdown enhanced, while glutamine and asparagine accumulated. Certain compounds absent in normal leaves were characteristic of specific deficiencies; allantoin and putrescine of K deficiency and homoserine of P deficiency. The accumulation of pipecolic acid and a decrease of lysine were characteristic of Mg deficiency.—Cornell Univ., Ithaca, N.Y.

3241. SMITH, W. J., AND KIRSHNER, N.
Enzymatic formation of noradrenaline by the banana plant.
J. biol. Chem., 1960, **235**: 3589-91, bibl. 8.

Hydroxytyramine was converted to noradrenaline by homogenates of various tissues of the banana plant, and no cofactor requirements for the banana enzyme were demonstrated. [From authors' summary.]—Duke Univ. med. Center, Durham, N.C.

3242. CHAMPION, J.
Quelques indications sur les besoins en eau du bananier "nain". (**Some observations on the water requirements of dwarf banana plants.**) [English, German, Spanish and Russian summaries approx. 11 lines each.]
Fruits d'Outre Mer, 1960, **15**: 387-400, bibl. 8, illus.

A review, mainly of work done in São Paulo (Brazil) and in Israel, on transpiration, water relations and irrigation.

3243. BRUN, W. A.
Simultaneous and continuous recordings of photosynthesis and transpiration from the upper and lower surfaces of intact banana leaves.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl): viii-ix.

By varying the light intensity incident upon the upper leaf surface it was found that there was a striking difference in the light intensity required to open the stomata on the two leaf surfaces. On the lower surface transpiration and photosynthesis were initiated at about 100 f.c.; whereas on the upper leaf surface 2,000 and sometimes 3,000 f.c. of white fluorescent light were required to initiate these processes. At light intensities up to 3,000 f.c. the rate of photosynthesis from the lower surface appeared to be limited by the degree of stomatal opening, as indicated by the fact that the photosynthetic curve followed the shape of the transpiration curve very closely.—United Fruit Co., Norwood, Mass.

3244. BARKER, W. G.
Responses of various portions of the banana flower to growth substances.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): v-vi.

Herbicidal levels of 2,4-D, sprayed directly on the fruits caused excessive elongation and twisting. Normal expansion of the fruit was prevented and ripening was affected. Growth substances, when applied in lanolin to the pedicel, stimulated growth on the treated side. Applied to the dorsal surface, 2,4,-D, at 50 p.p.m. in 0·1 ml. lanolin, caused the greatest effect, followed by para-CPA, NAA, IAA and IBA. MH, TIBA and GA had no appreciable effect. With NAA and 2,4-D graded responses were obtained, when the substances were applied at 50, 10, and 1 p.p.m. The angle between the control and treated ovaries after 48 hours could be used as an assay. Treatment of the stigma with 50 p.p.m. 2,4-D or NAA caused the style to be retained in a fresh condition long after the styles of untreated controls had fallen.—Cornell Univ., Ithaca.

3245. RHODES, P. L.
Oil spraying to control banana leaf spot disease in Fiji.
Agric. J. Dep. Agric. Fiji, 1960, **30**: 29-32, bibl. 1, illus.

In 1954 the average number of healthy leaves per plant carrying a mature bunch was 1·3, in 1957 with high volume zineb spraying it was 4·0, and in 1958 and in 1959 with low volume oil spraying it was 6·4 and 6·7. Regular sprayings of 1½ gal. per acre every 2 weeks from January to July, and thereafter 1 gal. per acre every 3 weeks are recommended. The cost is estimated at £13 per acre per annum.

3246. TOLLENAAR, D.
Effects of copper and oil in the control of sigatoka banana leaf spot.
Neth. J. agric. Sci., 1960, **8**: 253-60, bibl. 15, illus.

Experiments in Ecuador are described. The advantages of oil sprays were simplicity of spraying and a rapid, partially curative effect due to penetration into the leaves. These were offset, however, by lack of persistence on the leaf surface and by cumulative toxic effects. Copper sprays containing effective stickers were sufficiently persistent to need no repetition during the dry season and were highly protective against the conidial phase of the fungus, but they were not curative. Bancobre-01 has proved an excellent copper product for banana leaves, and was effectively applied by means of a Giraffe mist-blower.

3247. STOVER, R. H., HILDRETH, R. C., AND THORNTON, N. C.
Studies on *Fusarium* wilt of bananas. VII. Field control.
Canad. J. Bot., 1961, **39**: 197-206, bibl. 11, illus.

Flood fallow and silting were the only practices that consistently reduced the incidence of banana wilt induced by *F. oxysporum* f. *cubense*. The efficiency of flood fallow was greatly increased by inter-flood ploughing, and in most locations by post-flood fungicide drenches. Even these treatments, however, did not insure economic control in some areas. It was necessary, therefore, to select areas where soil factors tended to retard rapid disease development. Also, the absence of the banana host for a number of years previous to flood fallow appeared to influence treatment success. [Authors' abstract.]—Tela Railroad Co., La Lima, Honduras.

3248. Beckman, C. H., Mace, M. E., and Halmos, S.
Physical barriers in relation to *Fusarium* wilt resistance in bananas.
From abstr. in *Phytopathology*, 1960, **50**: 628.

Infection following puncture inoculations of Gros Michel plants was limited in the young upper roots, but extensive in the lower older roots owing to the increasing ease of internal particle movement with age.

3249. Venning, F. D.
Report on the decline of the Cuban banana industry by nematodes.
Proc. Carib. Reg. Amer. Soc. hort. Sci. 1958, 1958, **6**: 17-20, bibl. 11.

Decline in Cuban banana plantations was shown to be caused by the nematode, *Rotylenchus multicinctus*. The principal mode of spread is thought to be the use of infested setts for planting. No control measures are yet known.

3250. Rhodes, P. L.
A combination of spraying and dusting for banana scab moth control.
Agric. J. Dep. Agric. Fiji, 1960, **30**: 23-7, bibl. 2, illus.

Nacoleia octasema was controlled by 2 early sprayings with DDT emulsion to kill the larvae on hatching, followed by a second spray 2 days later and DDT dusting 2–4 days thereafter. Costings are given.

3251. Mann, G.
The carriage of bananas in refrigerated ships. The effect of wrapping on the rate of cooling.
Mem. D.S.I.R. Food Invest. **1136**, [undated], pp. 5, bibl. 1.

The rates of cooling in a wind tunnel were compared for 3 stems of bananas, each weighing 58 lb., 1 of which was unwrapped, 1 wrapped in straw and 1 wrapped in a ventilated polythene. The rate of temperature change was highest in the unwrapped and intermediate in the straw-wrapped fruit.—Ditton Lab., Maidstone, Kent.

3252. Meredith, D. S.
Studies on *Gloeosporium musarum* Cke. and Massee causing storage rots of Jamaican bananas. I. Anthracnose and its chemical control. II. Some factors influencing anthracnose development. III. Control with sodium salicylanilide ("Shirlan WS") and nystatin.
Ann. appl. Biol., 1960, **48**: 279-90, bibl. 22, illus., 518-28, bibl. 17, and 824-36, bibl. 28, illus.

Severity of anthracnose increases with increasing "grade" of maturity, "full" fruit being more seriously affected than "thin" fruit. The evidence suggests that Gros Michel fruit is less susceptible to this form of rot than fruit of the Lacatan or Robusta varieties. The amount of *Gloeosporium* rot on fruit imported into the United Kingdom undergoes marked seasonal variation, being greatest during autumn and winter. The presence of perforated polythene bags during cold storage (55° F.) appears to favour slightly the development of disease. Bagging had no significant effect on rotting during the subsequent ripening period. After wound-inoculation, disease incidence and severity decreased appreciably with increasing periods of storage at tropical temperatures (78°–87° F.) Such a decrease was evident even when the humidity at the surface of the fruit was maintained at a high level (92–100%). Shirlan WS at concentrations of 0·5, 1·0 and 1·5% provided approximately 30, 50 and 65% control, respectively, when inoculated fruit was dipped for 1 minute in the compound, but severe phytotoxic effects were caused by all concentrations. When this treatment was followed by rinsing in water there were no phytotoxic effects and approximately 15, 35 and 40% control of finger stalk rot, respectively, was obtained. Shirlan WS at 1·0 and 1·5% also effected good control of anthracnose, both with and without post-treatment washing. Moderate to poor control of *Gloeosporium* rot was obtained when Shirlan WS plus washing treatment was delayed for more than 24 hours after inoculation. A 2-minute immersion period in Shirlan WS was more effective than shorter periods; a momentary dip was ineffective. The antibiotic nystatin (200 and 400 p.p.m.) had no significant effect on the incidence of finger-stalk rot, and did not reduce the severity of main-stalk rot appreciably, but in shipping trials a post-harvest fruit dip gave 40–70% control of anthracnose. [From author's abstracts.]—Banana Board Res. Dep., Kingston, Jamaica.

3253. Elarosi, H.
***Gloeosporium* fruit rot of banana.**
Trans Brit. mycol. Soc., 1960, **43**: 681-7, bibl. 14, illus.

Development of the disease on mature, wounded and unwounded Cavendish fruits.

3254. McCreery, R. A.
The mineral content of abaca in relation to fertilizer use in Costa Rica.
Emp. J. exp. Agric., 1960, **28**: 305-14, bibl. 10.

Abaca grown on marginal land was given various fertilizer treatments and analysed for N, P, K, Ca and Mg. Over 6 years the increased yields with complete NPK (200 : 150 : 500 lb./acre) amounted to 30,000 lb. of additional stalk per acre, and with K (500 lb./acre) alone to 21,500 lb./acre. Only the response to K was significant. The contents of N, P and K were highest in the lamina of the youngest leaf. From the tip to the base of the lamina N decreased and K increased, and the content of N and K could be increased by fertilizers, whereas the P content was not consistently influenced by them. The lamina of the 3rd leaf proved satisfactory for the study of the nutrient status in respect of most of the elements studied, although for K the basal part of the pseudostem was preferable. Tables showing the results of analyses are given.—U.S.D.A. Turrialba, Costa Rica.

Cacao.

(*See also* 3223, 3224, 3227, 3354, 3555, 3560, 3563, 3566, 3601, 3603.)

3255. BARANYOVITS, F.
Cocoa.
I.C.I. Mag., 1960, **38**: 376-81, illus.

A popular, well illustrated account of its history and cultivation.

3256. U.S. DEP. AGRIC., FOREIGN AGRICULTURAL SERVICE.
1960-61 cocoa bean crop slightly below 1959-60 record.
Foreign Agric. Circ. U.S. Dep. Agric. **PCP 1-60**, 1960, pp. 19.

Estimated at 2,178 m. lb., 1·5% below the record.

3257. BRIANT, A. K.
Cocoa growing in Zanzibar.
[*Publ.*] *Zanzibar* [*Dep. Agric.*], 1959, pp. 17, 2s.

After a short historical introduction, local cacao growing problems are discussed, including insect pests and diseases. Practical recommendations are given on all aspects of growing the crop.

3258. INTER-AMERICAN CACAO CENTER, TURRIALBA.
Annual report, 1958.
Cacao, Turrialba, 1959, **4**(1): 3-31.

The research section describes work on diseases and their control (cushion gall, *Phytophthora palmivora*), insects and insecticides (DDT, dieldrin, insects as a cause of cherelle wilt), selection, breeding, propagation, mineral nutrition studies (fertilizer and shade, leaf analysis, nitrogen fertilization) and cacao pod meal as a cattle food.

3259. GUDKOV, V. P.
Glasshouse culture of cacao in the Soviet subtropics. [Russian, with English summary ½ p.]
Izv. Akad. Nauk S.S.S.R., Ser. biol., 1960, No. 4, pp. 562-73.

Experiments have shown that to ensure uninterrupted growth the temperature of the soil should not fall below 14° C., nor that of the air below 8° C., and diurnal temperature variations should be kept small. The best growth and fruiting was obtained in glasshouses heated during the winter, but satisfactory results were also achieved in unheated houses relying on orientation and heat accumulation in the soil. Growing the trees in tubs out of doors in the summer and under glass in the winter was unsuccessful, as was trench cultivation. Cacao trees under glass came into bearing in their 4th or 5th year and produced beans of normal quality. [See also *H.A.*, 30: 4402.]

3260. SORIA V., J.
Notes on the variability of cacao types in some Nicaraguan plantations and comments on their genetic constitution.
Cacao, Turrialba, 1959, **4**(2): 1-2, bibl. 6.

Criollo, calabacillo and amelonado types were observed during a visit by the author; the value of *Theobroma pentagona* in crosses to produce heterosis is discussed.

3261. EDWARD, I. L.
Clonal cacao at Keravat.—I.
Papua New Guinea agric. J., 1960, **13**: 43-51, bibl. 5, illus.

The value of using clonal material is discussed and detailed advice given on the establishment of rooted cuttings.

3262. HELFENBERGER, A.
Preliminary experiments on the effect of gibberellic acid on *Theobroma cacao*.
Proc. Carib. Reg. Amer. Soc. hort. Sci. 1959, 1959, 7: 36-40, illus., and *Cacao, Turrialba*, 1959, **4**(2): 3-5.

Cuttings of clone UF 613 responded to a quick dip in 10 p.p.m. GA by showing 80% rooting. This was the best result, and compares favourably with the standard hormone treatment for rooting; IBA is, however, cheaper. The application of GA failed to break bud dormancy, and buds which had sprouted were killed by the treatment. The degree of stimulation of seedling growth following the application of GA to terminal buds was very variable, and these responses need further study.

3263. GLENDINNING, D. R.
The relationship between growth and yield in cocoa varieties. [Dutch summary ½ p.]
Euphytica, 1960, **9**: 351-5.

From the results of a trial in 1954 of 10 varieties, 8 of which were hybrids from crosses between Amazon and either amelonado or trinitario varieties, the 9th a cross between 2 Amazon varieties and the 10th a trinitario variety, correlations were found to exist between the rate of growth before bearing and the total yield up to 5 years old, which for some varieties was as much as a ton of dry cocoa to the acre. These arose at least partly from the faster growing varieties reaching bearing size earlier and so do not prove a relationship between growth rate and long-term yield. After bearing started vegetative growth slowed down, and there was a high correlation between the reduction in growth rate and the total yield. This suggests that an equation "growth rate before bearing = growth rate while bearing + yield" may be used. A high yielding variety will thus be one making vigorous early growth, which is later relatively greatly reduced. No advantage in growing larger trees is expected in West Africa, as close spacing is always used. [From author's summary.]—N.A.C.R.I., Tafo, Ghana.

3264. Smith, R. W.
The spacing of West African amelonado cocoa in Ghana.
J. hort. Sci., 1960, **35**: 176-84, bibl. 11.

7½ × 7½ ft. was optimum for yield.

3265. Burridge, J. C., and Cunningham, R. K.
Cacao yield maps and soil fertility in Ghana.
Emp. J. exp. Agric., 1960, **28**: 327-34, bibl. 19, illus.

A technique is described for producing cacao yield contour maps. Yields on a soil developed under moist, semi-deciduous forest were shown to be correlated with the chemical analysis of the top 6-in. layer of the soil. [From authors' summary]. W.A.C.R.I., Tafo, Ghana.

3266. Alvim, P. de T.
Llave de los síntomas de deficiencias minerales en cacao. **(A key to the symptoms of mineral deficiencies in cacao.)**
Agronomía, Lima, 1958, **25** (93): 25-32, illus.

Including N, S, Fe, Mg, Mn, K, Ca, B, Zn, Cu, P and Mo.

3267. Alvim, P. de T.
Water requirements of cacao.
[*Publ.*] *Inst. interamer. Cien. agríc. O.E.A. Zona andina*, being [*Pap.*] *Ist FAO tech. Cacao Mtg Accra*, 1959, pp. 16, bibl. 25, and [in Spanish] *Turrialba*, 1960, **10**: 6-16.
Stomatal opening as a practical indicator of moisture deficiency in cacao.
Phyton, 1960, **15**: 79-89, bibl. 16.

Stomatal opening, photosynthesis, transpiration, vegetative growth and hence yield are progressively reduced when available soil moisture falls below 60–70%. The effects of shade vary with soils, shade trees and climate. Yield was found to be correlated with rainfall occurring 3–4 months before harvest where there is a dry season, and in Bahia summer rainfall is reflected in the yield of 2 years later. A simple technique for estimating stomatal opening by infiltration tests with liquid of low surface tension applied to the leaves was used to correlate the response of stomata with varying moisture supply. A mixture of 60% medicinal paraffin (Nujol) and 40% xylol or kerosene is recommended as an indicator for water deficiency below 50% available moisture in the soil. As long as water was not deficient and absorption by roots was normal, stomatal opening increased gradually with increasing light intensity up to 700 f.c., and the stomata remained wide open from 700 to 14,000 f.c. Strong sunlight did not induce partial stomatal closure as reported for coffee. Heavy shade (500 f.c. or less) decreased opening. The concept according to which water would be equally available to plants throughout the entire range of field capacity to permanent wilting does not seem to be applicable to cacao in so far as its stomatal behaviour is concerned. From the results obtained, stomatal opening—and hence probably photosynthesis and also yield—are reduced when available soil moisture falls below 50–60%.

3268. Navarrete S., C.
Resultados preliminares sobre estudios de evapotranspiración de cacao. **(Preliminary results from evapotranspiration studies with cacao.)**
Rev. Fac. nac. Agron. Colombia, 1960, **20**(54): 47-70, bibl. 14, illus.

In the Valle del Cauca region of Colombia the rainfall in February and March supplied 42·19% and 63·33%, respectively, of the water requirements of 3½-year-old cacao trees. In April the rainfall was in excess of the requirement. It is concluded that the irrigation requirements could not be accurately determined by an evapotranspiration study lasting less than 2 years.

3269. Alvim, P. de T.
El problema del sombreamiento del cacao bajo el punto de vista fisiológico. **(The problem of shading in cacao from the physiological standpoint.)**
Agronomía, Lima, 1958, **25**(92): 34-42, bibl. 7.

Tests carried out in Costa Rica on a hot, bright day, showed that the temperature of shaded cacao leaves was the same as that of the air surrounding them (28° C.), whereas the leaves of unshaded trees rose to 46–48° C. The transpiration rate in the sun was more than double that in the shade. Adult cacao trees do not reduce the stomatal apertures of their leaves in bright light, and thus are not shade plants by nature, but shade is beneficial during the first 5 months of growth. The resistance of cacao leaves to low light intensity was lower than in oranges and coffee, and higher than in *Ficus benjamina* and hevea. Sunlight may injure cacao leaves, but only after the sudden removal of shade, or at high altitudes, where the effect is primarily one of extreme variation in temperature from day to night. Insect pests are more prevalent in the unshaded crop. Growers in Peru are advised to experiment with only small areas of unshaded cacao, because the increase in yield may not prove sufficiently profitable to warrant large-scale adoption of this more costly system.

3270. McKelvie, A. D.
Cherelle wilt of cacao. II. Wilt in relation to yield.
J. exp. Bot., 1960, **11**: 413-24, bibl. 14.

It was found that increasing or decreasing flower setting had no effect on yield, as the crop was unrelated to the number of cherelles formed. Preventing setting till after the April flush had no effect on yield. Variations in [physiological] wilt between and within selections were studied, and it was concluded that yield is dependent on the nutrient status of the tree and independent of fluctuations in cherelle wilt. [From author's summary. For part I, see *H.A.*, 26: 4141.]—W. Afr. Cocoa Res. Inst., Tafo, Ghana.

3271. Thresh, J. M.
Quarantine arrangements for intercepting cocoa material infected with West African viruses.
FAO Plant Prot. Bull., 1960, **8**: 89-92, bibl. 6, illus.

The use of beans and budwood is recommended, the latter being tested on susceptible stocks after transit and finally top worked with susceptible material.

3272. Cornwell, P. B.
Movements of the vectors of virus diseases of cacao in Ghana. II. Wind movements and aerial dispersal.
Bull. ent. Res., 1960, **51**: 175-201, bibl. 14, illus.

Daily windspeeds and air movement at different elevations in a cacao area were studied, together with the aerial movements of mealy bug vectors in the field, sticky traps and seedling traps being used to measure their distribution. At least 8 species of pseudococcids which can transmit 1 or more cacao viruses were found to be carried by air currents. Aerial dispersal was more pronounced during the main dry season and the infestation rate of cacao seedlings was increased by 50% under artificial shade. Under a closed canopy most mealy bugs were caught at 2 and 10 ft. above the ground. The average daily wind speed from April to November, 1955, was 1·1 m.p.h. and the maximum wind speed recorded in February, 1955, was 7 m.p.h. Amongst cacao trees the wind speed was reduced 10–20 times. All instars of *Pseudococcus njalensis* withstood removal from a piece of wood at air speeds of 10 m.p.h. but could be removed by gentle tapping. This was also true of a number of other species. The radial and "jump spread" extension of infection by airborne vectors and the use of insecticides are discussed. [For part I, see *H.A.*, 29: 1982j.]—W.A.C.R.I., Tafo, Ghana.

3273. Brunt, A. A., and Kenten, R. H.
Mechanical transmission of cocoa swollen-shoot virus.
Virology, 1960, **12**: 328-30, bibl. 5.

By application of infected slurry to the embryo and inner surface of cacao half-beans prior to planting.

3274. Peng, O. H.
Sekitar penjakit "die-back" pada tanaman tjoklat. (**Cacao die-back disease.**) [English summary ¼ p.]
Menara Perk., 1960, **29**: 83-8, bibl. 12, illus.

A review of a condition which is serious in Malaya but, as yet, of minor importance in Indonesia.

3275. Delassus, M., Belin, M., and Bonaventure, P.
Contribution à l'étude des pourritures des cabosses du cacaoyer en Basse Côte d'Ivoire durant les années 1958 et 1959. (**Pod rots of cacao in the Lower Ivory Coast during the years 1958 and 1959.**)
Café, Cacao, Thé, 1960, **4**: 64-79, bibl. 18, illus.

Losses due to pod rots were 10–20% in 1958 and 6–8% in 1959. The incidence was increased by high rainfall and relatively low temperatures, and reduced by regular and frequent harvesting. *Phytophthora palmivora* was the commonest of the fungal pathogens. Copper fungicides were very effective, particularly in severe attacks, but would not necessarily be economic against light infections.

3276. Rohan, T. A.
The processing of cocoa.
Informal Wkg Bull., agric. Engng Br., FAO, **5**, 1960, pp. 105, bibl. 14½ pp., illus.

A short introduction giving the botanical and chemical background to cacao production is followed by a detailed description of processing operations. Harvesting and transport are mentioned, but the main part of the bulletin is devoted to fermentation (pp. 12-62.) Drying and storage are discussed, followed by some notes on quality assessment and manufacturers' requirements.

3277. Viton, A.
Storage of cocoa beans.
[*Publ.*] *FAO* **CCP/Cocoa/EC/20**, 1960, pp. 12, bibl. 1.

Detailed information on storage conditions and inspection, the incidence of insect infestation, moulds and other adverse factors and the preventive measures taken was received from 13 producing and 9 importing countries and is here summarized.

Coconuts.

(*See also* 3224, 3355, 3563, 3571, 3615.)

3278. Ninan, C. A., Pillai, R. V., and Joseph, J.
Cytogenetic studies in the genus *Cocos*. 1. Chromosome number in *C. australis* and *C. nucifera* L. vars. *spicata* and *androgena*.
Indian Coconut J., 1960, **13**: 129-34, bibl. 12, illus.

In *C. australis* 15; in the *C. nucifera* varieties 16.

3279. Ninan, C. A.
Some problems in resistance breeding in coconuts.
Coconut Bull., 1960, **14**: 251-5, 259.

Various aspects reviewed.

3280. Ninan, C. A.
Promising varieties and hybrids in coconuts.
Coconut Bull., 1960, **14**: 289-95, illus.

Superior varieties on trial at Kasaragod include Laccadive ordinary, S.S.Green, Fiji and New Guinea. Crosses between tall and dwarf types appear promising for early and heavy bearing, as do natural cross dwarfs.

3281. Nambiar, M. C.
Pollen irradiation and culture of pollen tubes of coconut.
Curr. Sci., 1960, **29**: 317-18, bibl. 2, illus.

Germination was normal in pollen subjected to 25,000 r of γ-radiation from a Co^{60} source, but it was completely inhibited by doses of 50,000 r and above. Artificial germination in a sucrose-gelatine medium was markedly improved by the addition of traces of boric acid.—I.A.R.I., New Delhi.

3282. Thomas, C. A., and Mathew, C.
A "trispatheate" coconut palm.
Coconut Bull., 1960, **14**: 256-9, illus.

Description of an abnormal inflorescence.

3283. Pandalai, K. M.
The root habit of the coconut palm.
Coconut Bull., 1960, **14**: 150-62, illus.

The various factors affecting root growth and development are considered. Owing to the extensive distribution of absorbing roots in the rhizosphere, fertilizers should be spread widely. Cultural methods for inducing free and vigorous rooting are discussed.

3284. Nethsinghe, D. A.
The manuring of adult coconut palms.
Ceylon Coconut Plant. Rev., 1960, **1**(1): 5-12.

Recommendations, based on the results of trials, are made on the types, quantities and times of application of fertilizers suitable for 7 different Ceylon soil types.

3285. Prevot, P., and Frémond, Y.
Fumure du cocotier au Dahomey. **(Coconut manuring in Dahomey.)**
Oléagineux, 1960, **15**: 549-53, bibl. 6.

In an old plantation at Semé-Podji Research Station, in which there was severe K deficiency, the application of 1·5 kg. KCl per tree p.a. increased the annual production of copra by 6 kg. per tree in one trial and by 3 kg. in another. Applying sulphate of ammonia and magnesium sulphate in addition gave a further increase of yield in one season only. N increased considerably the growth of young plantations in savannah areas.

3286. Rodrigo, P. A., Morada, E. K., and Zuniga, L. C.
Yield performance of some old coconut groves in the Philippines.
Coconut Bull., 1960, **14**: 187-94, 204, bibl. 6.

In one grove planted with Laguna type palms ranging in age from 30 to 70 years the yields varied from 0–80 nuts per tree per annum, with 80% of the trees yielding less than 40 nuts. In a second grove the range was 0–140, 78% of the trees yielding less than 60 nuts. In a third grove the range was 0–160, with only 37% of the trees yielding less than 60 nuts and over 8% more than 100 nuts. Replanting policy is discussed.

3287. Shanta, T., and Menon, K. P. V.
Cowpea (*Vigna sinensis* Endl.), an indicator plant for the coconut wilt virus.
Virology, 1960, **12**: 309-10, bibl. 2, illus.

3288. Luc, M., and Hoestra, H.
Les nématodes phytoparasites des sols de cocoteraie du Togo. Essai d'interprétation du peuplement. **(Plant-parasitic nematodes in the coconut soils of Togoland. An attempt to interpret their distribution.)** [English and Spanish summaries ½ p. each.]
Agron. trop., Paris, 1960, **15**: 497-512, bibl. 6.

The distribution of kaincopé disease (St. Paul's wilt) in coconut plantations of the area was not related to that found for any soil nematode species parasitic on coconut or other crops.

3289. Castillo, B. S., and Maramorosch, K.
Preliminary report on the boang disease of coconut in Mindanao, the Philippines.
FAO Plant Prot. Bull., 1960, **8**: 105-8, bibl. 5, illus.

This disease, which results in nuts with empty kernels or of greatly reduced size, is attributed to secondary infection by bacteria and fungi through the minute channel left by the emergence of an unidentified insect pest which infests the embryo during, or shortly after, pollination.—Bur. Plant Indust., Manila, and E.T.A. Program, FAO, Rome.

3290. Lever, R. J. A. W.
Leaf mining beetles of the coconut.
World Crops, 1960, **12**: 469-70, illus.

Dieldrin at 0·15%, DDT at 0·2% and chlordane at 0·16% are recommended for the control of *Brontispa* and *Promecotheca* spp. Effective biological control was observed in the Marianas and Malaya.

3291. Briant, A. K.
Coconut pest research.
Quart. Bull. Dep. Agric. Zanzibar, April/June 1960, pp. 9-13, illus.

The progress of research on the control of *Pseudotheraptus wayi* and the disappointing response of the palms to control measures [see *H.A.*, 30: 3040 and 4431] are discussed.

3292. PILLAI, G. B., AND KURIAN, C.
Effect of dieldrin different concentrations on *Nephantis serinopa* larvae.
Indian Coconut J., 1960, **13**: 154-62, bibl. 17.

The mortality after 7 days ranged from 57% with 0·01% dieldrin to 82% with 0·2%. The minimum lethal dose recommended is 0·05%, which gave 77% mortality.—Cent. Coconut Res. Stat., Kayangulam.

3293. KIRTHISINGHE, J. K. F.
Coconut caterpillar pest: new project for its control.
Ceylon Coconut Plant. Rev., 1960, **1**(1): 13-15, illus.

A note on the introduction of parasites of *Nephantis serinopa* from Bangalore. [See also *H.A.*, 29: 3068z.]

3294. GOONEWARDENA, H. F.
The rhinoceros beetle (*Oryctes rhinoceros* L.). Part IIA—Phototaxic responses of *Oryctes rhinoceros* L.
Ceylon Coconut Quart., 1959, **10**(1/2): 1-11, illus.
Phototaxic response in the rhinoceros beetle (*Oryctes rhinoceros* L.)
Trop. Agriculturist., 1960, **116**: 5-12, illus.

Beetles were attracted mostly to red and purple light, and females to colour generally more than males.

3295. SIMMONDS, F. J.
Biological control of the coconut scale, *Aspidiotus destructor* Sign., in Principe, Portugese West Africa.
Bull. ent. Res., 1960, **51**: 223-37, bibl. 2.

The coconut scale appeared on Principe prior to 1954 and caused a serious reduction in copra production. The coccinellid *Cryptognatha nodiceps* was introduced from Trinidad in 1955, and with it economic control of the scale was achieved by 1957. —Commonw. Inst. biol. Control, Ottawa.

3296. BHATIA, D. S.
Recent trends in coconut technology.
Coconut Bull., 1960, **14**: 195-201, bibl. 8.

Including brief descriptions of the Hiller, Krauss-Maffei, Robledano-Luzuriaga and Chayen processes for the production of meal and oil.

3297. AYERST, G.
Determination of moisture in copra. The P.I.L. moisture meter for copra.
World Crops, 1960, **12**: 384-6, illus.

A portable meter with a hand generator is described. This measures the resistance between 2 spikes pressed into a piece of copra.

3298. ROSS, E.
Trends in coconut processing research.
Hawaii Fm Sci., 1960, **9**(1): 3, 8, bibl. 2.

Trials on the production of a suitable concentrate from the "milk" obtained by pressing grated coconut meat.

3299. TUASON, A. M., AND REYES, A. T.
Water-soluble extract from coconut husk and its application in leather technology.
Philipp. J. Sci., 1960, **88**: 253-6, bibl. 4.

The tannin content of a water extract of coconut coir dust or fibre compared favourably with that of kamachile bark.

Coffee—general.

(*See also* 3223, 3603.)

3300. VICENTE-CHANDLER, J., ABRUNA, F., AND SILVA, S.
A guide to intensive coffee culture.
Prod. Res. Rep. U.S. Dep. Agric. **31**, 1959, pp. 51, illus.

Recommendations (based on investigations in Puerto Rico) are made on the following aspects of arabica growing: varieties (typica, caturra, bourbon, Mundo Novo), seedling production, plantation establishment, shade, soil management (cover crops, mulches, erosion control, weed control), fertilization (major elements, liming, minor elements including Fe, Mn, Zn, B and Mg, organic manures), pruning (single-stem, multiple-stem and Costa Rican, in which the trees are capped [tipped] when knee high and two verticals are allowed to develop), disease and pest control, harvesting and processing, and costs.

3301. U.S. DEP. AGRIC., FOREIGN AGRICULTURAL SERVICE.
World coffee crop below 1959-60 record.
Foreign Agric. Circ. U.S. Dep. Agric. **FCOF 3-60**, 1960, pp. 12.

1960-61 crop now estimated at 68·9 m. bags, 15% below the record.

3302. COFFEE RESEARCH STATION, RUIRU, KENYA.
Annual Report of the Coffee Research Station, Ruiru, and Coffee Research Services, Kenya, for 1959/60, 1960, pp.99, 25s., and also summarized in *Kenya Coffee*, 1960, **25**: 174-81.

Field investigations: Mulching all the inter-rows before the long rains in March raised the yield of clean coffee by more than 4 cwt. per acre, with a significant response to 46 lb. N per acre in the form of ammonium sulphate nitrate. Over the trial as a whole the response to sodium nitrate was also significant. Complete inter-row mulching also gave considerable increases in the yield of grade A coffee. K.7 remained the highest yielding selection resistant to leaf rust (race II) and N.100 showed evidence of resistance to coffee berry disease. After 2 months in the N.I.A.E. Burgess-type mist propagator capped single-nodal cuttings showed

97% growth. The most satisfactory compost for rooted cuttings proved to be one part vermiculite, one part coffee hulls and 2 parts coarse sand by volume. *Agricultural chemistry:* Regular Napier grass mulching was found to maintain a higher leaf phosphorus level, particularly during the dry months. The use of sodium nitrate as the N source resulted in a higher level of exchangeable Na in the soil. The efficiency of urea as a source of N was less than that of ammonium sulphate. The cause of amber beans was proved to be iron-deficient bearing wood on the trees. *Entomology:* A 2-phase method of antestia control has been devised; the trees are sprayed with 0·006% pyrethrins and the stumps are dusted with 5% DDT. Populations of tip borer moth, *Eucosma nereidopa*, were much reduced by spraying the trunks of shade trees with 2% DDT. *Variety trials:* The Indian varieties S.288, 333 and 795 continued to show immunity to races I and II of *Hemileia vastatrix*. Work continued on experimental plots of *Coffea excelsa* and *C. canephora*.

3303. WALLIS, J. A. N.
Field investigations and the coffee grower in Kenya.
Kenya Coffee, 1960, **28**: 459-65, bibl. 24, illus.

Work on selection, manuring, cultural methods, soil management and mechanization is reviewed.

3304. CHOKKANNA, N. G.
Progress of coffee research in India.
Plant. Chron., UPASI Conf. Suppl., 1960, pp. 29-31.

Brief notes on recent selections, nutrition and cultivation studies, disease and pest control.

3305. CASTILLO Z., J., AND PARRA H., J.
La utilización del invernadero en el estudio de los fertilizantes en café. **(The use of the greenhouse for coffee fertilizer studies.)**
Cenicafé, 1960, **11**: 41-50, bibl. 12.

Statistical analyses of pot experiments showed that guard rows are needed, the total number of plants (1 per pot in this instance) in each "plot" should be as high as possible, long, narrow "plots" are preferable to those tending toward a square shape, and that if these conditions are observed, the precision of the results is not impaired by increasing the number of treatment from 6 to 12.

Coffee—varieties, planting and culture.

(*See also* 3224, 3227.)

3306. RAO, Y. R. A., AND VISHVESHWARA, S.
Studies in polyploids of *Coffea*. 1. Polyploidy and stomata.
Indian Coffee, 1960, **24**: 303-6, bibl. 15.

The number of stomata per sq. cm. decreased, and the size of the stomatal aperture generally increased, from haploid to octoploid in a polyploid series.

3307. DIJKMAN, M. J., AND OTHERS.
Estudio preliminar sobre progénies de cafetos altamente productivas obtenidas en El Salvador. **(A preliminary study of highly productive coffee progenies obtained in El Salvador.)**
Proc. Carib. Reg. Amer. Soc. hort. Sci. 1959. 1959, **7**: 22-35, bibl. 7.

The study showed that most of the coffee varieties cultivated in America are unstable hybrids. The new high-yielding lines include 32 bourbon types, 19 intermediate and 1 arabica.

3308. INDIAN COFFEE BOARD COFFEE QUALITY COMMITTEE.
Performance of Station selections—field performances, crop, triage (CT) and quality factors.
Indian Coffee, 1960, **24**: 395-8.

Selections S.288 and S.795 were more resistant to leaf disease, equal in quality and yield to Kents, but with a higher triage.

3309. NARASIMHASWAMY, R. L.
Arabica selection S.795—its origin and performance—a study.
Indian Coffee, 1960, **24**: 197-204, bibl. 8, illus.

S.795 originated at Balehonnur from a cross between S.288-23 and Kents, and was selected for resistance to leaf disease and vigorous growth. This cultivar maintains its growth and yield under widely differing conditions of altitude, soil, rainfall and climate, and now comprises 25–30% of the arabica acreage in India.

3310. VILANOVA, T.
De la almaciguera a la plantación. **(From the nursery to the plantation.)**
Café, El Salvador, No. 320-321, reprinted in *Agronomía, Lima*, 1958, **25**(94): 43-5.

Methods in use in El Salvador for preparing nursery soils and for transplanting young coffee are described. Plants of 2 years and over may be successfully transplanted with bare roots. Mulching with fallen leaves from shade trees is beneficial to the transplants.

3311. MACHADO S., A.
El transplante del cafeto. **(Transplanting coffee.)**
Cenicafé, 1960, **11**: 5-14, bibl. 13.

For *Coffea arabica* var. *typica* in Colombia transplanting was best carried out by keeping a ball of soil round the roots and not removing any leaves. The rainy season was the best time for transplanting, and the operation was facilitated by growing the seedlings in individual pots in the nursery.

3312. SCARANARI, H. J.
Covas para o plantio de café. **(Holes for planting coffee.)**
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(400): 7-8.

Data from Colombia and Kenya are briefly reviewed, leading to recommendations for São Paulo (Brazil) of 60 × 60 × 60 cm. for the size of each hole, and the incorporation in each of 20 kg. of decomposed FYM, 500 g. of bone meal or superphosphate and 100 g. of potassium chloride.

3313. DE CAMARGO, A. P.
A serragem salitrada no combate à geada. **(Sawdust treated with nitrate of soda for frost control.)**
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(398): 12-14, illus.

A smoke-producing mixture developed at Paraná for the control of frost in coffee plantations consists of 20 kg. dry sawdust, 8 kg. dry sieved nitrate of soda, 6 l. diesel oil and 4 l. water. These ingredients are thoroughly mixed and placed in a hole in the ground 40–50 cm. across and 70–80 cm. deep with a wooden or metal lid perforated with holes 5–7 cm. in diameter. The mixture occupies about half the hole leaving an empty space for cooling the smoke after ignition. Combustion is started by means of a fuse leading down into the impregnated sawdust and having at its end a bag containing 1 teaspoonful of gunpowder, 4 of dry nitrate of soda and 4 of dry sawdust. The fuse is lit when the temperature in the coffee plantation falls to 2° C. 4–5 holes per alqueire [= 2·42 ha.] are sufficient.—Secc. clim. agric. Inst. Agron., Campinas.

3314. LEMÉE, G., AND BOYER, J.
Influence de l'humidité du sol sur l'économie d'eau et la croissance de caféiers du groupe *canephora* cultivés en Côte d'Ivoire. **(The effect of soil moisture on the water economy and growth of *canephora* coffee grown in the Ivory Coast.)**
Café, Cacao, Thé, 1960, **4**: 55-63, illus.

The variety Kouilou de Touba, the most drought-resistant of the *canephora* group, showed low values for cuticular transpiration, and a high capacity for root absorption. Thus the stomata remained open under conditions of partial drought, resulting in little or no reduction of the growth rate. In the variety Robusta INEAC, however, the stomata closed while the soil moisture deficit was still small, with consequent reduction in photosynthesis and growth.

3315. ANON.
Sprinkler irrigation in coffee plantations.
Plant. Chron., UPASI Conf. Suppl., 1960, pp. 34-6, illus.

Advantages and installations described.

3316. WALLIS, J. A. N.
Note on grasses for mulching coffee.
Kenya Coffee, 1960, **25**: 366-7, illus.

A report is given on 22 species of *Cymbopogon*, *Echinochloa*, *Hyparrhenia*, *Panicum* and *Pennisetum*, with details of persistence, K content, germination of seed, ease of handling and yield.

3317. HAARER, A. E.
Shade for coffee.
World Crops, 1960, **12**: 465-6, illus.

The advantages of shade trees over drastic pruning for the prevention of overbearing are discussed.

3318. ANANTH, B. R., IYENGAR, B. R. V., AND CHOKKANNA, N. G.
Studies on the seasonal variations of plant foods under different shade trees.
Indian Coffee, 1960, **24**: 347-61, bibl. 5.

As shade trees *Ficus glomerata*, followed by *Bischofia javanica*, *Albizzia stipulata* and *Erythrina lithosperma* in that order, provided the greatest quantities and most uniform supply of plant nutrients in coffee plantations. Data are tabulated and shown graphically for 6 tree species.—Coffee Res. Stat., Chikmagalur, Mysore.

3319. SUÁREZ DE CASTRO, F.
Valor de la pulpa de café como abono. **(Value of coffee pulp as manure.)**
Agric. trop., Bogotá, 1960, **16**: 503-13, bibl. 13, illus.

Colombian analyses show that coffee pulp contains 1·7% total N, 0·05% total P and 1·06% K_2O and that pulp ash contains 10·3% P_2O_5, 52·9% K_2O, 3·8% CaO, 7·6% MgO, 0·82% Cl and 3·27% SO_2. In a manurial trial at Blonay the coffee berry yields per tree were 4,999 g. with 9 l. decomposed pulp per tree p.a., 2,802 with 9 l. FYM, 2,788 with 500 g. bone meal plus 15% S, 2,735 with 500 g. bone meal and 1,541 in the control. In a 1-year trial at Chinchiná the parchment coffee yields per ha. were 2,188 and 1,348 kg. with and without 10 kg. decomposed pulp per tree, 1,713 and 1,823 kg. with and without 22 g. superphosphate per tree and 1,760 and 1,776 kg. with and without 100 g. K_2SO_4 per tree. In a 6-year trial at Chinchiná the average annual yield of parchment coffee per ha. was 2,694 kg. with 5 gal. pulp plus 250 g. nitrate of soda per tree p.a., 2,333 with 1 kg. 8–8–8 fertilizer and 2,204 in the control.

3320. JONES, P. A., ROBINSON, J. B. D., AND WALLIS, J. A. N.
Fertilizers, manure, and mulch in Kenya coffee growing.
Emp. J. exp. Agric., 1960, **28**: 335-62, bibl. 21.

Although available P was at a low level in most soils several P fertilizers failed to give increased yields. In trials comparing ammonium sulphate, sodium nitrate plus ammonium sulphate and sodium nitrate, only the last raised the yield significantly. Advice is given on mulching and manuring. [See also *H.A.*, 30: 4443 and 4444.]—Coffee Res. Stat.. Ruiru, Kenya.

3321. HAAG, H. P., AND MALAVOLTA, E.
Estudos sôbre a alimentação do cafeeiro. II. Efeito das deficiências dos macronutrientes no crescimento e na composição química do cafeeiro (*Coffea arabica* L. var. *bourbon* (B. Rodr.) Choussy) cultivado em solução nutritiva. **(Coffee nutrition studies. III. The effects of major-nutrient deficiencies on the growth and chemical composition of the coffee plant (*Coffea arabica* var. *bourbon*) grown in nutrient solution.)** [English summary ¾ p.]
Rev. Café portug., 1960, 7(26): 5-18, bibl. 23.
In addition to N, P and K, the study included Ca, Mg and S. Both leaves and stems were below the normal dry weight when any one of these elements was excluded from the solution. Sub-normal root dry weights resulted from omitting N, Ca or Mg, but in plants lacking K, P or S the roots were higher in dry weight than those of the controls. Data on the composition of young and old leaves are tabulated. [See also *H.A.*, 29: 888 and 30: 6159.]

3322. ROBINSON, J. B. D.
Nitrogen studies in a coffee soil. I. Seasonal trends of natural soil nitrate and ammonia in relation to crop growth, soil moisture and rainfall.
J. agric. Sci., 1960, **55**: 333-8, bibl. 19.
When rainfall is heavy and persistent at the beginning of a rainy period, soil nitrate-N levels decrease rapidly, partly because of leaching losses and partly through uptake by the crop. When the onset of the rainfall season is more gentle and substantial water movement through the upper part of the soil profile does not take place, nitrate-N values do not decrease rapidly and there is indirect evidence of the stimulatory effect of this type of rainfall on nitrate-N formation in a re-moistened field soil. Rapid and substantial build-up of nitrate-N is shown to take place during dry weather between the rainfall periods. This is particularly marked in the top 6 in. of the soil profile and is attributed to nitrate-N formation in the absence of leaching losses, to a decreased rate of uptake by the coffee trees in the absence of vigorous growth and to the physical movement of nitrate-N upwards into the top soil. Results show that alternate periods of rain and sunshine, rather than continuous heavy rain, will favour high soil nitrate-N levels and a more satisfactory nitrogen nutrition of the coffee tree. During periods of very low soil moisture ammonia-N builds up in the dry top-soil. The sharp peak and rapid decline in the rate of coffee growth during the long rainy period coincides with very low soil nitrate-N values, although climatologically conditions for continued growth are still excellent. This suggests that low available soil nitrate-N may be at least partially responsible for this early and rapid decline in the growth rate. [From author's summary.]—Coffee Services, Dep. Agric., Kenya.

3323. FORESTIER, J.
Fertilité des sols des caféières en République Centrafricaine. IV. Études sur le phosphore dans les sols latéritiques. **(The fertility of coffee soils in the Central African Republic. IV. Studies on the phosphorus in lateritic soils.)** [English and Spanish summaries ½ p. each.]
Agron. trop., Paris, 1960, **15**: 543-67, bibl. 27.
A study of acid-soluble P contents and P fixation with a view to assessing fertilizer requirements. [For part III, see *H.A.*, 30: 6154.]

3324. LOTT, W. L., MCCLUNG, A. C., AND MEDCALF, J. C.
Sulfur deficiency in coffee.
Bull. IBEC Res. Inst. **22**, 1960, pp. 24, bibl. 15, illus.
Mean values of 60 p.p.m. sulphate S were obtained in leaves of coffee plants showing extreme S deficiency symptoms and of 93 p.p.m. where moderate S deficiency symptoms were observed. Normal plants, also grown in a glasshouse in a soil with a low sulphur content, showed a mean figure of 221 p.p.m. In field plots deficiency symptoms occurring after the application of low sulphur fertilizers were cured by the use of gypsum at 20–40 lb. S per acre. A survey of 57 coffee plantations indicated very little S deficiency under existing low fertilizer application practice.

3325. VILANOVA, T.
Como y cuando crecen los cafetos. **(How and when coffee trees grow.)**
Agronomía, Lima, 1958, **25**(94): 41-2.
Growth rhythms of lateral shoots are described.

3326. GAIE, W.
Principes de taille du caféier d'Arabie applicables au Ruanda-Urundi. **(Principles of arabica coffee training and pruning applicable in Ruanda Urundi.)** [Flemish summary 2 pp.]
Bull. agric. Congo belge, 1960, **51**: 303-20, illus.
Multiple-stem training is carried out by false agobiada, the single main stem being bent over to induce the production of vertical secondaries, 3 of which are retained. Production pruning consists essentially of the de-suckering and the progressive removal of the lower side branches over a period of years. Regeneration pruning is practised when

most of the trees have reached 3 m. in height or have had their lower side branches removed to a height of 1·7 m., and consists of the gradual replacement of the old main stems by 3 new ones.

3327. POCHET, P.
Prévisions de l'importance des récoltes dans les caféières de Yangambi. **(Yield estimation in the coffee plantations of Yagambi.)**
Bull. Inf. I.N.É.A.C., 1960, **9**: 71-9, bibl. 12.
Details are given of a method of estimation based on 3 factors: (1) the characteristics of the period of growth (production of fruiting wood) during the 20 months previous to the harvest to be estimated, which depend on the amount of rainfall during the short rains in March/April; (2) the level of the two previous yields (a high yield is always followed by a medium or a low yield, and a low yield by a medium or a high one) and (3) the intensity of flowering preceding the harvest to be estimated, which depends on the rainfall during the rainy season and the characteristics of the dry season. In the example given the estimate differed by only 38 kg. (4·9%) from the actual yield of 1,190 kg. saleable coffee per ha.

Coffee—diseases and pests.

(*See also* 1822, 1844, 3300, 3302, 3304, 3593.)

3328. VISHVESHWARA, S.
Studies on morphology and anatomy of certain abnormal growths in arabica coffee.
Indian Coffee, 1960, **24**: 362-5, bibl. 2, illus.
Leaf yellowing and malformation and shoot die-back described and attributed to physiological disorders.

3329. GEORGE, K. V.
Diseases of coffee in South India.
Plant. Chron., 1960, **55**: 515-17.
Rust, black-rot, die-back, pink disease, stump and root rot, collar rot, brown eye spot, stem-wasting disease and some minor diseases briefly described. [See also *H.A.*, 30: 4452.]

3330. NUTMAN, F. J., AND ROBERTS, F. M.
Investigations on a disease of *Coffea arabica* caused by a form of *Colletotrichum coffeanum* Noack. II. Some factors affecting germination and infection, and their relation to disease distribution.
Trans Brit. mycol. Soc., 1960, **43**: 643-59, bibl. 6.
For part I, see *H.A.*, 31: 1454.

3331. CORBETT, D. C. M.
***Fusarium* bark diseases of coffee in Nyasaland.**
Nyasaland Fmr For., 1959, **4**(4): 3-7, bibl. 19.
Bark disease, collar rot and scaly bark are different expressions of attack by *Fusarium lateritium* var. *longum*. Care during pruning and the use of fungicidal paint are recommended.

3332. RAYNER, R. W.
Rust disease of coffee. 4. Control by fungicide.
World Crops, 1960, **12**: 309-12, bibl. 7, illus.
Perenox, Blitox and burgundy mixture all gave effective control in trials in Kenya. Captan also gave good control, but copper sprays are preferred because they also reduce leaf shedding. [For parts 1–3, see *H.A.*, 31: 1455; see also *H.A.*, 30: 2888 and 4456.]—Commonw. mycol. Inst., Kew.

3333. BOCK, K. R.
Interim recommendations for the control of coffee leaf rust.
Kenya Coffee, 1960, **25**: 372-5.
Extensive experiments have enabled tentative recommendations to be made. In areas east of the Rift Valley 2 high volume sprays of 7 lb. of a 50% copper formulation per acre immediately before the short rains and 2–3 further sprays in March and April are required. West of the Rift Valley not less than 3 such applications should be made during February to April, supplemented by 2 in October/November wherever the disease is severe. Elsewhere 2 sprays immediately before the rains are recommended.

3334. WALLIS, J. A. N., AND FIRMAN, I. D.
Preliminary report on the control of leaf rust by low volume spraying.
Kenya Coffee, 1960, **25**: 417-21.
Promising results with less than 10 gal./acre, but no suitable sprayers can yet be recommended.

3335. MCKINLAY, K. S., MESMER, E. T., AND LEE, C. W.
A comparison of two tractor mounted airblast sprayers for applying low volume sprays to multiple stem coffee.
Misc. Rep. Colon. Pestic. Res. Unit **274**, [1960], pp. 13.
The Micron sprayer tested had 2 outlets, one on each side; the Chiron 4 outlets grouped like the fingers of a hand. The Chiron gave much heavier deposits at 3 and 5 ft. height than at 7 ft., whereas the Micron gave substantially the same deposit at all 3 heights. Within its height range, however, the Chiron gave better coverage with higher deposits and less variation. Suggestions are made for improving both types.

3336. FLÜCK, V.
Über ein Infektionsverfahren mit *Mycena citricolor*. **(An infection experiment with *Mycena citricolor*.)** [English summary ½ p.]
Phytopath. Z., 1961, **40**: 248-57, bibl. 11, illus.
On coffee and coleus.

3337. TAPLEY, R. G.
The white coffee borer, *Anthores leuconotus* Pasc., and its control.
Bull. ent. Res., 1960, **51**: 279-301, bibl. 40, illus.

Loss of crop due to borer in one case where infestation was very light and not continuous was estimated at 0·4 cwt. of clean coffee per acre per year. Where infestations are heavy and continuous, the loss is certainly very much higher. Wild host trees are listed, among which *Rangia* and *Vangueria* spp. are important. If robusta coffee is attacked, the trees show a form of resistance; the bark splits open following oviposition and eggs are left exposed. Control measures recommended to coffee growers in the past have been reviewed and found to be unsuitable for modern farming. Experiments in which the effectiveness of various insecticides and methods of application were tested since 1950 are described. A spray containing 0·5% dieldrin in emulsified solution applied at the rate of 18 gal. per acre to the lower part of the coffee stems (540 trees per acre) has given excellent protection from borer and persists effectively in the bark for up to 27 months. A marker, methylene blue, is included in the spray mixture to warn operators of the presence of dieldrin on skin and clothing and to improve spraying efficiency. The persistence of dieldrin and its method of destroying borer is discussed. [From author's summary].—Coffee Res. Stat.. Moshi, Tanganyika.

3338. INDIAN COFFEE BOARD RESEARCH DEPARTMENT.
Increased incidence of green-bug on coffee.
Indian Coffee, 1960, **24**: 307.

Folidol E605, 46·7% a.i., Ekatox 20% w.p. and HETP at 4, 16 and 20 oz./100 gal., respectively, recommended for control.

3339. FERRÃO, A. P. DA F.
Indicações sobre os insecticidas mais empregados em cafeicultura. (**Notes on the insecticides most commonly used in coffee growing.**)
Rev. Café portug., 1960, **7**(25): 40-72.

Lead arsenate, DDT, BHC, lindane, aldrin, dieldrin, endrin, chlordane, parathion, E-605, malathion and the sticker Adisol.

Coffee—processing and quality.

(*See also* 3300.)

3340. FERRAZ, M. DE B., AND VEIGA, A. DE A.
Melhor bebida e maior poder germinativo do café. (**A better beverage and higher germinating capacity in coffee.**) [English summary ½ p.]
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(398): 5-11, and (399): 6-18, bibl. 4, illus.

To produce coffee beans giving a high quality beverage the optimal drying temperature was 45° C., and temperatures of 50° C. or higher very markedly reduced the quality. The germination capacity was highest when drying was carried out at 40° C. The data refer to yellow bourbon coffee, depulped and dried immediately after harvesting.

3341. McCLOY, J. F.
Ventilated conditioning bins.
Kenya Coffee, 1960, **25**: 368-71, 423-5, bibl. 2, illus.

In 7 tests of the liquoring qualities of beans stored in ventilated bins at the white coffee stage, only one, in which the storage period was 30 days, showed any deterioration. Black coffee finished in the bins showed no deterioration in quality compared with sun finishing in 8 trials, in which the length of the finishing period and the methods of ventilation varied. The moisture content of over-dried coffee can also be restored by use of these bins. Methods of construction and operation are given.

3342. NOGUEIRA, M. DE A.
Ensilagem do café. (**Coffee storage in silos.**)
Bol. Super. Serv. Café, S. Paulo, 1960, **35**(400): 9-12.

The advantages of storing coffee in granaries or in sealed underground and semi-underground silos are discussed.

3343. ESTEVES, A. B.
Características dos cafés portugueses. 1. Cafés de São Tomé e Príncipe. (**Characteristics of Portuguese coffees. I. Coffees of São Tomé and Principe).**
Rev. Café portug., 1959, **6**(24): 35-59.

Including laboratory methods for determining the physical, chemical and technological characteristics of arabica and liberica coffees.

3344. ESTEVES, A. B.
Análise granulométrica de café cru comercial. (**Bean-size analysis of raw commercial coffee.**) [English summary 1¼ pp.]
Rev. Café portug., 1960, **7**(25): 73-88, and (26): 19-61, bibl. 31, illus.

The article describes the extraction, cleaning and homogenizing of coffee samples and apparatus and methods for grading. Bean sizes for different species of coffee, and for coffees of different geographical origin are compared.

Guavas.

3345. GOPALKRISHNA, N., AND KHANDUJA, S. D.
Improvement of guava by selection.
Poona agric. Coll. Mag., 1960, **51**: 50-4, bibl. 4.

Seven selected clones are described, of which Lucknow-24 and Dharwar have markedly higher vitamin C contents than the remainder.

Mangoes.

(*See also* 3563.)

3346. Siddiqui, S. H.
The mango.
Agric. Pakist., 1960, **11**: 75-110, bibl. 85.

Botanical characteristics, climatic, soil and water requirements, nutrition and temperature relations.

3347. Aragaki, M., and Ishii, M.
Fungicidal control of mango anthracnose.
Plant Dis. Reptr, 1960, **44**: 318-23, bibl. 11.

In preliminary trials in 1955 for the control of anthracnose (*Colletotrichum gloeosporioides*) on Haden mango 9 weekly applications of captan, zineb, maneb and cuprous oxide were made, beginning on 5 April at the time of flowering. Captan 50% w.p. at 4 lb. per 100 gal. plus a spreader per acre gave the best results, namely, 83% disease-free fruit compared with 23% in the control. In further trials on Haden in 1957 3 treatment schedules gave significantly better yields than the control. These schedules, which began on 10 April shortly before the flowers opened, were: 4 weekly zineb sprays (2 lb. 65% w.p. per 100 gal.) followed by 3 fortnightly copper sprays (2 lb. cuprous oxide 90% w.p. per 100 gal.); 2 weekly captan sprays (3 lb. 50% w.p. per 100 gal.) followed by 2 weekly zineb sprays and then by 3 fortnightly captan sprays; and 7 fortnightly captan sprays. In another investigation in 1957 on the effects of fungicides on fruit set in the high-yielding, anthracnose-susceptible Wootten variety captan (which reduced set in Haden) and zineb were compared. Five weekly applications of 3 lb. captan or 2 lb. zineb per 100 gal. beginning on 7 February were followed by 3 applications at 3-week intervals. There was a very high initial set with captan, but this was gradually lost and at harvest time there was little to choose between captan and zineb, although both gave higher yields than the control. —Univ. Hawaii, Honololu.

3348. Sarkar, A.
Leaf spot disease of *Mangifera indica* L. caused by *Pestalotia mangiferae* Butl.
Lloydia, 1960, **23**: 1-7, bibl. 4.

Fungal behaviour is described. Of the varieties Bombai, Himsager and Langra, the first is the most susceptible, Langra the least and Himsagar moderately susceptible.

3349. Wheatley, P. E.
Insect pests in the Coast Province of Kenya. I. Mango.
E. Afr. agric. For. J., 1960, **26**: 129-31.

The scale insects *Aulacaspis cinnamomi* and *Pulvinaria* sp. may be controlled by full cover sprays of malathion at 3 pt. of 50% emulsion or diazinon at 1¼ pt. of 60% emulsion per 100 gal. applied twice with a 3-week interval. To control *Selenothrips rubrocinctus* 3 pt. of 50% malathion emulsion per 100 gal. is recommended, the spray being directed at the under sides of the leaves. Collecting and destroying fallen and rotting fruit twice a week is the only way to combat the mango seed weevil, *Cryptorhynchus mangiferae*. Of several minor pests mentioned the fruit fly *Pardalaspis cosyra* may be controlled by poison baits and by dusting the soil beneath the trees with 10% DDT dust.

3350. Venugopal, S.
A note on *Eublemma versicolora* Wlk., a webber on the inflorescence of *Mangifera indica* in Madras State.
J. Madras Univ., Sect. B, 1959, **29**: 153-4, bibl. 2, illus.

The pest is described; it was controlled by a 0·1% spray of BHC or aldrin.

3351. Date, W. B.
Preharvest treatment with growth regulators on ascorbic acid content of mangoes.
Sci. and Cult., 1960, **26**: 227-8, bibl. 2.

The fruit was sprayed 5 weeks before harvest. The ascorbic acid contents (mg. per 100 g.) before and after storage (47–50° F., R.H. 85%) were as follows: (1) sprayed with MH-40 1,000 p.p.m., 112 and 151, compared with 103 and 99 in the controls; (2) sprayed with 2,4,5-T at 200 p.p.m., 124 and 136 compared with 112 and 100 in the controls; and (3) sprayed with MH-40 at 1,000 p.p.m. plus 2,4,5-T at 100 p.p.m., 105·5 and 188 compared with 94·5 and 100 in the controls.—Cent. Food Tech. Res. Inst., Mysore-2.

Oil palms.

(*See also* 3560.)

3352. Rees, A. R.
Effect of high-temperature pre-treatment on the germination of oil palm seed.
Nature, 1960, **189**: 74-5, bibl. 4.

Dura seed was kept for 80 days in polythene-covered jars at 39·5° C. and at 4 different moisture contents, viz. 14, 19, 21 and 24%. After 80 days the jars were brought to ambient temperatures. Some of the seeds were soaked for 5 days and then slightly dried to optimal moisture content, while others were left unchanged. Excellent germination was obtained in all cases in which the heat-treated, air-dry seed was afterwards cooled at the optimum moisture content. The high temperature requirement, corresponding to low temperature stratification of temperate seeds, was thus satisfied at a low seed moisture content. [See also *H.A.*, 30: 2927 and 2928.]—W.A.I.F.O.R., Benin, Nigeria.

3353. Marynen, T., and Poels, G.
Considérations sur les méthodes de mise en place du palmier à huile. **(Considerations on the methods of planting oil palms.)**
Bull. Inf. I.N.É.A.C., 1960, **9**: 81-106, bibl. 3, illus.

In a trial at Bokondji, in which all the seedlings had been germinated in pre-nursery beds, the best 3 planting treatments were: (1) planting out in previously prepared holes plus mulching (cumulative yield for the first 3 years = 100%); (2) planting out after 5 months in baskets into previously prepared holes plus mulching (85%); (3) planting out without previous preparation of the holes plus mulching (83%). In 2 similar trials at Yangambi. in which 13 treatments were compared, the 5 treatments which gave the earliest yields were: (1) sowing 3 germinated seeds per site in the field plus lateral shade; (2) sowing in tall baskets in the pre-nursery followed by planting out in the baskets plus lateral shade; (3) sowing in beds in the pre-nursery, transplanting into baskets in the nursery and planting out in the baskets with lateral shade; (4) and (5) sowing in baskets in the pre-nursery, followed by a period in baskets in the nursery and planting out in the baskets with and without lateral shade. In a third trial, in which 4 treatments were compared, the best results were obtained by germinating in baskets in the pre-nursery and planting out the seedlings when they had 3–4 open leaves. These came into production 6 months earlier than plants which underwent the normal practice, viz. 3–4 months in baskets in the pre-nursery, 12 months in the nursery bed, ball-planting plus mulching.

3354. Garot, A., and Subadi, —.
Tanaman tjoklat dibawah kelapa sawit dikebun Marihat dan Pebatu di Sumatera-Utara. **(Inter-cropping of oil palms with cacao on the P.P.N. estates Marihat and Pebatu in North Sumatra.)** [English summary ½ p.]
Menara Perk., 1960, **29**: 123-9, illus.

At Pebatu, where 40% of the oil palms in plantations were replaced by cacao, with gliricidia as shade trees, a good yield of cacao was obtained with only an 8% decrease in palm-oil yield. At Marihat interplanting with cacao, and with *Flemingia congesta* to provide ground cover and mulching material, resulted in heavier crops from the oil palms.

3355. Prevot, P.
Utilisation du diagnostic foliaire à l'Institut de Recherches pour les Huiles et Oléagineux (I.R.H.O.) **(Using foliar diagnosis methods at the I.R.H.O.)**
C.R. Acad. Agric. Fr., 1960, **46**: 866-8.

A short account of the organization dealing with this fast developing method and the results being obtained. Critical levels for the oil palm and coconut (17th leaf from the centre) for N, P, K, Ca and Mg are 2·50, 0·15, 1·00, 0·60 and 0·24% and 1·70, 0·10, 0·45, 0·50 and 0·35%, respectively. [See also *H.A.*, 30: 6140 and earlier.]

3356. Gruner, G.
The role of potassium in the nutrition of the oil palm.
World Crops, 1960, **12**: 435-7, illus.

Deficiency symptoms, soil and foliar analyses and the interactions between nutrients are reviewed. Maximum growth and yield have been obtained with K, Ca and Mg in the proportions 67–70%. 19–24%, and 10–13%, respectively, the sum of the 3 cations amounting to about 2·7% of dry weight. In young plantings the best growth improvement has been observed following ring placement of fertilizer. Recommendations for fertilizer dosages under various circumstances are given.

3357. Heinisch, K. F., and Maun-Alibazah, R. A. P.
Dielectric moisture determination in oil palm products.
Planter, Kuala Lumpur, 1960, **36**: 362-7, bibl. 7.

An English version of *H.A.*, 29: 2985.

3358. Ferrand, M.
Le noli (*Elaeis melanococca* ou *Corozo oleifera*) en Colombie. **(The noli palm (*Elaeis melanococca* or *Corozo oleifera*) in Colombia.)**
Oléagineux, 1960, **15**: 823-7, illus.

Growth, production, oil yield and processing are described. The noli is suited to areas with too long a dry season for *E. guineensis* and is also less sensitive than the latter to a high water-table.

3359. Poliakoff, J.
Le macaüba (*Acrocomia sclerocarpa*). Son intérêt dans l'économie sud-américaine des corps gras. **(Macaüba palms (*Acrocomia sclerocarpa*). Their interest for the South American oil industry.)**
Oléagineux, 1961, **16**: 37-40, illus.

This palm differs from *Elaeis* in growing at relatively high altitudes (500–800 m.) and in a dry climate. The tree is described, and details of composition are given for the fruits and the seeds. The chemical and physical characteristics of the oils from the fruit pulp and seeds are described.

Pineapples.

(*See also* 3224, 3543, 3563.)

3360. Cannon, R. C.
Pineapple research; what's in store for the grower?
Qd agric. J., 1960, **86**: 635-42, illus.

Subjects reviewed include land management, plant improvement, nutrition, plant spacing, chemical weed control, crop management (including flowering control) and fruit quality. Recent trials showed that soil applications of sulphate of potash before planting were more efficient than applications to the base leaves every 6 months, giving a higher yield and requiring only half the amount of fertilizer. Planting 19,000 plants per acre instead of 14,000 increased yields by up to 30%. Diuron and atrazine have shown promise in recent herbicide trials and may be superior to monuron and PCP. April or May applications of α-NAA or acetylene advanced flowering by 1 month. Forcing treatments applied from August to December were also effective. Early treatment resulted in a shorter interval between plant and ratoon crops thus increasing the annual yield per acre.

3361. Wang, H., and Chang, S. M.
A comparison of the four types of Smooth Cayenne pineapple (II). [Chinese, with English summary ¾ p.]
Rep. Taiwan agric. Res. Inst. **10**, 1960, pp. 7, bibl. 15.

The types investigated were Normal Smooth. Sarawak, Elevated Eye and Collar of Slips. The average percentage of winter fruiting in the plant crop was very low in all types, but in the ratoon crop the Normal Smooth Cayenne gave 89·7% fruiting, Sarawak and Elevated Eye 69·7% and Collar of Slips 48·9%, Elevated Eye being the earliest. Total yields per hectare were: Normal Smooth Cayenne 153%, Sarawak 125% and Elevated Eye 110% of the yield of Collar of Slips. [For part I, see *H.A.*, 30: 4473, see also *H.A.*, 29: 4067.]

3362. Tisseau, M.-A.
La protection contre l'érosion dans les plantations pilotes d'ananas. (**Protection against erosion in pilot plantations of pineapples.**) [English, German, Spanish and Russian summaries approx. 12 lines each.]
Fruits d'Outre Mer, 1960, **15**: 415-17, illus.

Soil conservation recommendations.

3363. Wang, H., Chang, S. M., and Huang, C. C.
A soil conservation experiment on a sloping pineapple field (1). [Chinese, with English summary 1¼ pp.]
Rep. Taiwan agric. Res. Inst. **9**, 1960, pp. 14. bibl. 6.

On a clay loam soil with a 1 in 5 slope pineapples were planted in 5 ways, viz. (1) on bench terraces, 180 plants per plot, mulched with rice straw; (2) close planted on the contour, 198 per plot, mulched with straw; (3) as (2) but without mulch; (4) as (3) but 132 plants per plot; and (5) vertical rows, 132 per plot, with no mulch. Run-off increased from 2·73% in (1) to 21·8% in (5) and soil erosion loss in 3 years from 0·124 tons per ha. in (1) to 185·48 tons per ha. in (5). Run-off and soil loss were greatest when the plants were young. Soil moisture in the dry season was highest in treatment (2). The height of plants was greatest in (2) followed by (1), (3), (4) and (5). Fruit yield per ha. was highest in (2) and lowest in (5).

3364. Cannon, R. C.
Save on costs of fertilizer for pineapples.
Qd agric. J., 1960, **86**: 473-5, illus.

A pre-planting soil application of 0–4–37 fertilizer mixture is recommended at the rate of 1,000 lb./acre plus 28 lb. each of copper sulphate and zinc sulphate if "crookneck" is present, followed by a leaf spray of urea (1 lb./gal.) every 2 months. The amount of spray required varies from 30–50 gal./acre depending on the age of the plants. To correct manganese-induced Fe deficiency, iron sulphate (5 oz./gal.) may be added to the 10% urea spray. Care must be taken to avoid run-off which may cause burning. A saving of £50 per acre is made using the above method instead of the old system of base-leaf fertilization.

3365. Hall, J. T., and McPaul, J. W.
Pineapple growing.
Agric. J. Dep. Agric. Fiji, 1960, **30**: 19-22, illus.

In a fertilizer trial the application of 37½ lb. of a 10 : 6 : 10 mixture of urea, superphosphate and sulphate of potash per 1,000 plants every 4 months, plus foliar-applied iron sulphate, gave the highest yields.

3366. Gowing, D. P., and Leeper, R. W.
Uncommon plant growth regulators for the control of nutgrass and oxalis.
Weeds, N. York, 1960, **8**: 279-83, bibl. 3.

A number of phenoxyacetic, phenylacetic, benzoic and salicylic acids and various other growth regulators, which did not induce out of season flowering in pineapples, were tested on *Cyperus rotundus* and *Oxalis martiana*. Several compounds were satisfactory against both species.—Pineapple Res. Inst., Hawaii.—From *Weed Abstr.*, **9**, No. 1473.

3367. Gowing, D. P., and Leeper, R. W.
Studies on the relation of chemical structure to plant growth-regulator activity in the pineapple plant. II. Compounds related to phenoxyalkylcarboxylic acids, phthalamic acids, and benzoic acids.
Bot. Gaz., 1960, **121**: 249-57, bibl. 13.

The results are recorded of tests on 151 esters, amides, nitriles, amino acids and other derivatives of phenoxyalkylcarboxylic acids and related compounds for flower induction, flower inhibition and toxicity. [For part I, see *H.A.*, 31: 1499.]—Pineapple Res. Inst., Hawaii.

3368. WANG, H., HUANG, C. C., AND CHANG, S. M. **Study on the influence of close planting on pineapple wilt.** [Chinese, with English summary 1½ pp.]
Rep. Taiwan agric. Res. Inst. **11**, 1960, pp. 13, bibl. 9.

Pineapples were spaced at 25,000 and 40,000 plants per ha., with and without mealybug control. Mealybug control increased the number of leaves per plant and reduced the incidence of wilt from 6·94–7·43% to 0·79–1·01%. Wider spacing had no influence on wilt incidence, but it increased the percentage of plants fruiting and the size of the fruit, while reducing the yield per hectare. [See also *H.A.*, 1495.]

Rubber trees.

(*See also* 2850, 3223, 3560.)

3369. LÉGER, F.
The beginnings of rubber growing in Malaya.
HUTSON, V. M.
The smallholders' part in the Malayan rubber industry.
HASTINGS, J. D.
Rubber research in Malaya.
Rev. gén. Caoutch., 1960, **37**: 1092-5, 1096-1102, 1103-7, all in French and English, illus.

The first article is historical, ranging from the first mission to Brazil in 1873 until the present time. The second deals largely with government schemes to develop smallholdings, and the third outlines the story of rubber research work from 1876 up to the present day.

3370. RUBBER RESEARCH INSTITUTE OF MALAYA.
Annual Report, 1959, 1960, pp. 144, $3.

Results reported include the following: *Soils division:* The most effective alternatives to sodium arsenite for routine control of mixed broad-leaved weeds and grasses were dalapon, dalapon plus aminotriazole and sodium chlorate. Creeping legumes proved the most suitable ground covers. In pot cultures seedling hevea required an application of Ca 70 days after sowing, of P at 115 days and of K at 148 days. *Botanical division.* Rooting of hardwood cuttings proved unsuccessful but leafy cuttings of clones PB 86 and GT 1 rooted readily after a fungicidal dip. *Pathological division:* Power-operated knapsack mist-blowers proved satisfactory for the application of fungicides to control bird's eye spot (*Helminthosporium heveae*). Cockchafer grubs (*Holotrichia bidentata*) were killed most rapidly by heptachlor poured into holes dibbled around each tree.

3371. RUBBER RESEARCH INSTITUTE OF CEYLON.
Annual Report for 1959, 1960, pp. 130.

Botany department: The only surviving tree of clone RRIC 28 in tapping yielded 56·6 lb. dry rubber in 1959; 10 other RRIC clones have yielded over 30 lb. per tree per year. Experiments on yield stimulation indicated that the width of bark stimulated must be restricted to 2 in. for single-cut tapping systems, while in the wet lowland districts only light scraping was found to be safe. Buddings of mixed clones giving 700–800 lb. per acre per year gave a 46% increase in yield in the second year of treatment with 6-monthly applications of stimulant on scraped bark. On unscraped bark the increment was only 14%. With moderate-yielding clones upward tapping on virgin bark gave a 36% increase over downward tapping in renewed bark. The use of high-yielding clones as crown buds has increased the yield of the centre sections, PB 86 being outstanding for this purpose. *Plant breeding section:* Some success was obtained in flower inducement experiments, which may reduce the waiting period for the recently introduced *Dothidella*-resistant and *Phytophthora*-tolerant clones by 3 years. *Chemistry department:* Preliminary trials have shown significant differences in quality between latex gathered in coconut shells and that collected in aluminium cups, the microflocculates being 0·12% and 0·07%, respectively. In several cases the use of formic acid in place of acetic acid as a coagulant has improved the quality of the sheet. Oxalic acid has been found to improve the colour-holding properties of the crepe.

3372. I.R.C.V.
Institut des Recherches sur le Caoutchouc au Viêt-Nam, Rapport Annuel 1958. **(Annual Report of the Rubber Research Institute of Viêt-Nam for 1958),** Laikhé, 1959, pp. 250.

The research work reported is in two sections, viz. fundamental and applied research. The fundamental studies are concerned with the following: the anatomy and physiology of renewal bark, the effects of stimulation and the movement of minerals in the xylem; basic aspects of physiological diagnosis; organic aspects of tree metabolism, particularly of carbohydrates in the latex and bark and of the various forms of phosphorus compounds in the latex; and the development of micro-organisms in fresh latex. The applied research in progress deals particularly with selection and breeding and the early selection of high yielding clones, stock-scion relations, experiments on spacing and tapping methods, the practical application of physiological diagnosis, latex stimulation, and disease control, notably of *Phytophthora palmivora*, *Corticium salmonicolor* and *Oidium*.

3373. I.R.C.C.
Institut des Recherches sur le Caoutchouc au Cambodge, Rapport Annuel 1958. (**Annual Report of the Rubber Research Institute of Cambodia for 1958**), 1959, pp. 92.

Investigations in Cambodia follow much the same pattern as the applied research in Viêt-Nam [see preceding abstract], viz. selection and breeding (the best clones yield about 2,000 kg./ha. or more). stock-scion relations and early selection of high yielders, tapping and spacing trials, stimulation methods and, last but by no means least, methods of physiological diagnosis of mineral status and nutritional needs.

3374. GAROT, A., AND PARDEDE, S. M.
Pengaruh okulasi tadjuk terhadap okulasi biasa. **(Preliminary results on the influence of high budded crowns on the growth of normal buddings.)** [English summary ¼ p.]
Menara Perk., 1960, **29**: 103-11, bibl. 2, illus.

Crowns of LCB 870, FX 25, FX 4037 and LCB 1320 clones were budded at 1·70, 2·35 and 3·00 m. onto 2-year-old buddings of LCB 1320. Budding was more successful at 3 m. than at 1·7 m., but the lower the crown, the more vigorous was the stem growth. Normal buddings of LCB 1320 were better than the double buddings. The growth of FX 4037 was disappointing; FX 25 was better than LCB 870, but still not so good as LCB 1320.

3375. EVERS, E., VERBEKE, R., AND MAERTENS, C.
Relations entre le climat, la phénologie et la production de l'hévéa. **(Relations between climate, phenology and rubber production.)**
Publ. Sér. sci. I.N.É.A.C. **84**, 1960, pp. 71. bibl. 16, illus, 100 F. belge.

Observations on interactions between climate, phenology and production over 10 years are recorded and discussed in relation to their practical implications. Clones with dense crowns, which throw a heavy shade, reduce the amount of adventitious growth and thus lower the cost of maintenance. On these clones the leaves live longer and support tapping better, especially under unfavourable conditions. Relative humidity is important for the renewal of the foliage, and should be taken into account when siting new plantations. Reduction of tapping also increases refoliation, and the temporary loss in yield can be made good by artificial stimulation. This combination of rest period and artificial stimulation is considered to have several advantages.

3376. CADET.
Establishment of leguminous creeping crops [in rubber plantations].
Planter, Kuala Lumpur, 1960, **36**: 539-47.

Calopogonium mucunoides, *Pueraria phaseoloides*, *Centrosema pubescens* and their advantages as ground covers in rubber plantations are described. Soil preparation, pre-sowing seed treatment to ensure good germination, sowing and subsequent maintenance are outlined. Inoculation with the correct strain of *Rhizobium* is recommended.

3377. SUBADI, —.
Tanaman sela diantara pohon karet. **(Rice as a catchcrop in young rubber.)** [English summary ½ p.]
Menara Perk., 1960, **29**: 153-9, illus.

The cultivation and weeding given to the rice benefits young rubber; costings are given.

3378. LE BRAS, J.
La physiologie au service de l'amélioration du rendement de l'hévéa. **(How physiology improves the yield of hevea.** [French and English.]
Rev. gén. Caoutch., 1960, **37**: 493-507, bibl. 15, illus.

This is a good description of the method of physiological diagnosis developed by E. R. Beaufils at the Viêt-Nam Institut de Recherches sur le Caoutchouc. [See also *H.A.*, 30: 6197, 29: 4077 and earlier.]

3379. ANON.
Recent developments in the diagnosis of fertilizer requirements.
Plant. Bull. R.R.I.M., 1960, No. 51, pp. 112-14, illus.

The physiological diagnosis of nutrient requirements by leaf and latex analyses as developed by E. R. Beaufils in Viêt-Nam [see previous abstract] is discussed and experiments initiated in Malaya to evaluate the method are described.

3380. MIDDLETON, K. R.
A comparison of rock phosphate and superphosphate as sources of phosphorus for seedling rubber.
J. Rubb. Res. Inst. Malaya, 1960, **16**: 139-53, bibl. 18, illus.

In pot experiments superphosphate was shown to be a better source of P than rock phosphate when put into pockets in the soil but not when broadcast or mixed with the soil. Liming depressed the response to rock phosphate, but not to superphosphate.

3381. WATSON, G. A.
Interactions of lime and molybdate in the nutrition of *Centrosema pubescens* and *Pueraria phaseoloides*.
J. Rubb. Res. Inst. Malaya, 1960, **16**: 126-31, bibl. 18.

In 2 pot culture experiments on 3 sedentary soil types the uptake of Mo at a soil pH value of below 5 was sufficiently low to limit plant growth. The application of sodium molybdate at 1 lb. per acre and/or liming the soil to pH 6 increased the Mo and N contents of the plants and also increased dry weight production. It is suggested that the beneficial effect of liming is mainly due to its effect on Mo uptake. [From author's summary.]

3382. Anon.
Stimulation of yield: a comparison of proprietary yield stimulants.
Plant. Bull. R.R.I.M., 1960, No. 51, pp. 114-19.

Of the 4 proprietary stimulants tested, all of which induced yield increases of about 30%, Stimulex (2,4-D) was less injurious to bark tissue than those based on 2,4,5-T. The yield increase from 3 alternate monthly applications of Stimulex above the tapping cut was similar to that obtained from 1 application to 3 in. of scraped bark. Costs are given.

3383. Nair, V. T. S.
Rainguards for rubber trees.
Plant. Chron., UPASI Conf. Suppl., 1960. pp. 32-3.

A pleated Alkathene [polythene] strip, 300 gauge and 15 in. wide, fixed 4–5 in. above the cut during the rainy season.

3384. Anon.
Heat scorch by pebbles.
Plant. Bull. R.R.I.M., 1960, No. 51, pp. 125-6, illus.

A lethal scorch of seedlings produced by contact with dark-coloured pebbles under intense insolation was prevented by mulching with lalang straw.

3385. de Jong, P.
Aerial spraying of rubber.
World Crops, 1960, **12**: 467-8, illus.

Methods for the control of *Phytophthora palmivora* and *Oidium* spp.

3386. Riggenbach, A.
On *Fomes lignosus* (Klotzsch) Bres. the causative agent of the white root disease of the Para rubber tree *Hevea brasiliensis* Muell. Arg.
Phytopath. Z., 1960, **40**: 187-212, bibl. 70, illus.

Studies on the nutrition of the fungus.

3387. I.N.É.A.C., Divisions de Phytopathologie et de l'Hévéa.
Le traitement des panneaux de saignée atteints d'altérations chancreuses. **(Treatment of cankered tapping panels.)**
Bull. Inf. I.N.É.A.C., 1960, **9**: 137-8.

The symptoms of black stripe (*Phytophthora palmivora*) are described. Good control has been obtained by applying 2% refined carbolineum several hours after tapping (S/2, d/2), or a protective oil once a month, or sump oil at the end of a tapping cycle or at other times as required.

3388. Anon.
Trapping cockchafer beetles.
Plant. Bull. R.R.I.M., 1960, No. 51, pp. 122-4, illus.

Details of light traps for *Holotrichia bidentata*. which causes damage in rubber estates. [See also *H.A.*, 30: 6199.]

Sugar cane—general.

(*See also* 3223.)

3389. Sagar, N.
Yield of sugarcane in India.
Indian Sugar, 1960, **10**: 333-40, bibl. 16.

Yield statistics are presented for the various areas, and ways of improvement are discussed.

3390. Vaithinathan, S.
Yield potentialities of sugarcane and its maximisation in Madras State with special reference to South Arcot District.
Indian J. Sugarcane Res., 1960, **4**: 239-44, bibl. 11.

A rise of 60% in the yield per acre over the past 10 years in the South Arcot District is ascribed to the selection of better varieties and increased attention to correct cultural and manurial practices.—Sugarcane Res. Stat., Cuddalore, Madras.

Sugar cane—breeding, flowering, seedling production and varieties.

(*See also* 3424.)

3391. Barbados.
The Twenty-sixth Annual Report of the British West Indies Central Sugar Cane Breeding Station, Barbados, for the year ending 30th September, 1959, 1960, pp. 46.

In variety trials B.5401, 5480, and 54142 showed promise. Dowpon was tried for the chemical emasculation of arrows, but the correct dosage has not yet been ascertained. Heat treatment of setts for the prevention of ratoon stunting disease appeared to increase arrowing and lower yields.

3392. George, E. F.
Factors affecting the initiation of flowering in sugar cane.
Rev. agric. sucr. Maurice, 1960, **39**: 328-40, bibl. 25.

Photoperiodism in sugar cane is discussed and recent work reviewed. Whereas flowering can be suppressed in various ways, no reliable method of inducing flowering is as yet available.

3393. Skinner, J. C.
Gravimorphism in sugar cane.
Tech. Commun. Qd Bur. Sugar Exp. Stats **1** to **4**, 1960, pp. 3-8, bibl. 6, illus.

In a field experiment in which the stems of growing cane were bent horizontal, apical dominance was lost and growth was markedly reduced. The number of nodes was not affected, but the internodes and leaf sheaths were shorter. Although not conclusive, the evidence indicated that flowering might be induced, other factors being favourable.

3394. Yusuf, N. D.
The control of arrowing and fuzz production in sugar cane under sub-tropical conditions.
Int. Sugar. J, 1958, **60**: 219-21, bibl. 6, illus.

Two methods were found for obtaining viable seed from sugar cane grown under conditions unsuited to seed production. These were, first, abundant irrigation and an increase of day length by artificial illumination, and, secondly, exposure to adverse conditions at heights of 2,500–4,000 ft.—Dep. Agric., Lyallpur, Pakistan.

3395. Juang, P. Y.
Studies on the date of flower bud formation in sugar-cane. [Chinese, with English summary 1 p.]
Rep. Taiwan Sugar Exp. Stat., 1958, No. 18, pp. 14-23, bibl. 12.

Flower buds of clones of *S. robustum* and *S. officinarum* were not observed until mid-October, whereas some clones in the *S. spontaneum* group frequently developed flower buds in late June. With the breeding canes under test flower bud development occurred between 21 and 25 September, this date being unaffected by planting date or place. The date of flower bud development was more easily altered in shy-tasselling varieties than in free-tasselling varieties.

3396. Ragavan, K.
Potential vivipary in *Saccharum spontaneum* and hybrid sugarcane.
Sci. and Cult., 1960, **26**: 129-30, bibl. 5, illus.

Vivipary was induced in arrows of *S. spontaneum* and a hybrid Coimbatore cane (Co. 1126) by daily sprays of water and covering with a plastic sheet during blooming.—Sugarcane Breed. Inst., Coimbatore.

3397. Lee, S., and Loo, Y. S.
Report of some experiments on the germination of true sugarcane seed. [Chinese, with English summary 1¼ pp.]
Rep. Taiwan Sugar Exp. Stat., 1958, No. 18, pp. 1-13, bibl. 6, illus.

Growth in length and width of the seeds after cross pollination was most rapid in the first 10 days. The seed reached its maximum width 20 days after pollination and its maximum length and dry weight after 30 days. Seeds collected 15 days after pollination germinated very poorly and produced weak seedlings. Seeds collected 30 days after pollination were fully ripened, germinated well and produced vigorous seedlings. Immature seeds (20–25 days) germinated better after 3–6 days' drying. For long-term storage drying the seeds in a desiccator, with a drying agent, at 4°–5° C. was necessary.

3398. Vijayalakshmi, U., and Rao, J. T.
Effects of gamma-rays on germination and growth in some species and hybrids of *Saccharum*.
Curr. Sci., 1960, **29**: 397-8, bibl. 2.

The effects of dosages ranging from 500 to 10,000 r on 5 species and 3 hybrids indicated that the maximum safe dosage for normal germination and growth was about 3,000 r.—Sugarcane Breed. Inst., Coimbatore.

3399. Willcox, O. W.
Selection of cane varieties by nitrogen content.
Sugar y Azúcar, 1958, **53**(5): 32-4.

For this purpose the total N content of millable stalks at harvest should be used. The interrelationship between the N contents of cane and soil and the hybrid vigour of selections is discussed.

3400. Trippi, V., and Montaldi, E. R.
The aging of sugarcane clones.
Phyton, 1960, **14**: 79-91, bibl. 64, illus.

Historical and physiological aspects are discussed. It is suggested that if the basal portions of the stalk were used for propagation, the process of ageing would be prevented or at least delayed.

3401. Cross, W. E.
A study on the possible existence of variety yield decline in the Argentine.
Int. Sugar J., 1960, **62**: 87-8, bibl. 5.

No evidence that decline has occurred either in old or newly introduced varieties.

3402. Cross, W. E.
The "San Pablo" seedling varieties of Tucuman.
Int. Sugar J, 1959, **61**: 99-101.

Developed from hybrid seed from Hawaii San Pablo 46, 49, 160 and 163 are all superior to the standard Tuc. 2645 and are now in commercial production. Descriptions, parentage and yield data are given.

3403. Ethirajan, A. S.
Anatomical peculiarities of two interesting clones of *Saccharum officinarum* L.
Curr. Sci., 1960, **29**: 396-7, bibl. 4, illus.

Abnormal internodes in 51N.G.121 and 51N.G.131 from New Guinea.

3404. Buzacott, J. H.
A vigorous hybrid sugar cane.
Cane Grs' quart. Bull., 1960, **24**: 69-70, illus.

53B45, the first cross between P.O.J.2878 as pollinator and a *robustum* cane, 51N.G.140, from New Guinea.

3405. Hughes, C. G.
A new sport in Q.50.
Cane Grs' quart. Bull., 1960, **24**: 49-50, illus.

With variegated leaves.

3406. VIJAYALAKSHMI, U., AND ETHIRAJAN, A. S.
Stem epidermal pattern of pubescent culms in certain clones of *Saccharum officinarum*, L.
Curr. Sci., 1960, **29**: 400-1, bibl. 4, illus.

In 5 clones with pubescent culms pubescence was associated with an increase in the number of cork cells in the epidermis.

3407. KHANNA, K. L., SHARMA, S. L., AND SRIVASTAVA, R. C.
Outstanding canes of Bihar. V—B.O.17. A morphological study.
Indian J. Sugarcane Res., 1960, **5**: 9-16, bibl. 6, illus.

3408. NAGI, O. P., AND MISHRA, D. N.
Lodging in *Saccharum spontaneum* L.
Indian J. Sugarcane Res., 1960, **4**: 224-6, bibl. 6, illus.

Lodging was observed in only 5 of the 97 clones studied. Measurements of the stalks and internodes of lodging types and observations on the flower biology of lodging and non-lodging plants are presented.—Sugarcane Res. Inst., Pusa, Bihar.

3409. SUGARCANE BREEDING INSTITUTE, COIMBATORE.
Co. 740, a new variety showing promise in tropical India.
Indian J. Sugarcane Res., 1960, **4**: 245-6, illus.

Better than, and replacing, Co. 419.

3410. BHOJ, R. L.
A new early variety for Central U.P.—Co. 859.
Indian Sugar, 1960, **10**: 353-6, illus.

A hybrid of Co.527 and 453 that has proved superior to both Co.527 and Co.S.321.

3411. TABAYOYONG, F. T.
Sugarcane variety experiments harvested during the last three crop years (1957-1959) in the Victorias Milling District.
Sugar News, 1960, **36**: 460-8.

Performances of numerous varieties are tabulated: CP.29/116, Co.440 and Co.449 are recommended for extended planting. [See also *H.A.*, 29: 1940.]

3412. TABAYOYONG, F. T., AND OTHERS.
Variety × fertilizer tests conducted in the Victorias Milling District during the 1958-59 crop year.
Sugar News, 1960, **36**: 317-27, bibl. 6.

The results of 7 trials are tabulated and discussed. H.44-3098, Co.449, Co.440, H.37-1933 and B.41227 gave the highest yields, P.O.J.3016 and H.44-3098 had the highest purity. The most generally profitable fertilizer mixture proved to be 120 N : 100 P_2O_5 : 215 K_2O kg./ha. The most profitable combination was Co.449 supplied with an 80 : 80 : 135 fertilizer mixture. [For the 1957–58 results, see *H.A.*, 30: 2961.]

Sugar cane—planting, cultivation and weed control.

(*See also* 3224, 3462.)

3413. BUZACOTT, J. H.
Curvature of cane setts.
Cane Grs' quart. Bull., 1960, **24**: 51-2, illus.

Caused by premature cutting of too long setts from immature cane.

3414. JOGLEKAR, Y. R., AND LIMAYE, J. V.
One-eye-bud vertical—an evolution in the method of planting sugarcane.
Indian J. Sugarcane Res., 1960, **4**: 230-3, illus.

In an experiment to compare vertical with normal planting the former was shown to reduce the "seed" rate, improve quality and sugar yield, and lower costs.

3415. ALERS-ALERS, S., SAMUELS, G., AND LANDRAU, P., JR.
Influence of time of planting on the growth of sugarcane variety P.R. 980 at Rio Piedras.
[Spanish summary ½ p.]
J. Agric. Univ. P.R., 1960, **44**: 45-52, bibl. 4.

Plantings were made at 27-day intervals throughout the year. The greatest heights at 7 months were made by cane planted in May and June, and the least by cane planted in October and November. Cane planted from April to August had reached 3 feet or more after 4 months and required less weeding than that planted during the rest of the year. The lowest yield of cane was associated with the lowest rate of growth, but the highest yields were not consistently associated with the most vigorous growth.

3416. MENON, R. G.
The IISR bullock-drawn sugarcane planter (Indian patent No. 57617).
Indian Sugar, 1960, **10**: 215-18, illus.

A simple implement, drawn by 2 bullocks and operated by 3 men, reducing costs by over 30% compared with all-manual planting.

3417. MATHER, P. S.
On the utility of trash mulch in sugarcane fields.
Indian J. Sugarcane Res., 1960, **4**: 192-201, bibl. 8, illus.

A trash cover of 2–4 in. after germination was compared with normal hoeing and weeding and control plots over 4 years. Although the greatest number of tillers per plant was obtained under normal cultivation, the number of millable canes per acre was the same in both treatments, the height of cane was greater in the trashed plots and in 3 experiments the yield of cane was significantly greater with the mulch. The trash cover suppressed weed growth, conserved soil moisture and reduced costs of production.—Sugarcane Res. Stat., Shahjahanpur, U.P.

3418. Rochecouste, E.
Future trends in the chemical weeding of cane fields in Mauritius.
Rev. agric. sucr. Maurice, 1960, **39**: 264-70.

The replacement of MCPA and 2,4-D herbicides by CMU, DCMU formulations is considered to offer better possibilities of weed control in the super-humid zone. The discovery of strains of *Cynodon dactylon* differing in their resistance to herbicides is noted.

3419. Gordon, J.
Weeds—what must we do about them?
S. Afr. Sugar J., 1960, **44**: 951, 953, illus.

Experimental results are cited to emphasize the importance of clean weeding before the start of secondary growth. Subsequent weeding can be confined to cleaning the inter-rows by mechanical means.

3420. Orsenigo, J. R.
The effect of dalapon on sugarcane growth and yield.
Mimeo. Rep. Everglades Stat., Fla, **60-22**, 1960, pp. 3.

Two directed applications of dalapon at 3 lb./acre one month apart, applied when grass weeds were young, gave satisfactory weed control and did not reduce growth or the yield of 96° sugar compared with the cultivated control. Yields were reduced by 2 applications at 4 lb./acre.—From *Weed Abstr.*, **9**, No. 1135.

3421. Roth, H. E.
Up-to-date weed control in sugar cane.
Int. Sugar J., 1960, **62**: 207-9, illus.

The advantages of pre-emergent treatment with simazine.

Sugar cane—climatic factors and irrigation.

3422. Wilson, J.
Some observations on the effects of frost on sugar cane in the cane belt during 1960.
S. Afr. Sugar J., 1960, **44**: 837-9.

The degrees of frost damage to sugar cane are described, ranging from purely superficial injury to complete death of the plant. It was noticed that cane which had been burnt prior to the previous harvest, and also plant cane where no trash was present, suffered little or no damage.—S. Afr. Sugar Ass. Exp. Stat.

3423. Smith, N. M.
A word on frost damage.
Cane Grs' quart. Bull., 1960, **24**: 42-3.

Stalk, as well as leaf, injury must be considered when assessing damage. N.Co.310 and Pindar showed the least stalk injury.

3424. Vijayasaradhy, M.
Study of the tissue reaction to low temperatures and the assessment of frost resistance in sugarcane.
Indian J. Sugarcane Res., 1960, **5**: 49-53, bibl. 19.

Experiments on 36 cane varieties showed that the change in osmotic concentration, as determined by plasmolysis with CaCl, produced by exposure to a temperature of 3–5° C. for 5 days was a reliable indication of frost resistance. Frost susceptible strains, such as the wild spontaneums, exhibited little change, whereas there was a considerable increase in osmotic concentration in resistant varieties.—Sugarcane Breeding Inst., Coimbatore.

3425. Rouillard, G.
Les dommages causés aux cannes par les cyclones Alix et Carol. (**Damage to canes caused by the cyclones Alix and Carol).**
Rev. agric. sucr. Maurice, 1960, **39**: 174-81, bibl. 1, illus.

3426. Acharya, R. C., and others.
Studies on crop-weather relationship. II. The influence of weekly rainfall on sugarcane yields at the Government Experimental Farm, Pusa, Bihar.
Indian J. Sugarcane Res., 1960, **4**: 187-91, bibl. 5.

Rainfall and yields over the period 1936 to 1957 are analysed, but the influence of rainfall on yields could not be clearly established. Above-normal rainfall in January and February, during planting, appeared to reduce yields, whereas above-normal rainfall in March, April, May and early June considerably improved yields, thereby indicating the need for irrigation during this period in normal years. [For part I, see *H.A.*, 30: 6212.]—Sugarcane Res. Inst., Pusa, Bihar.

3427. Hargreaves, G. H.
Monthly irrigation requirements of sugarcane.
Sugar News, 1960, **36**: 366-9.

Based on evapo-transpiration records the monthly water requirements of sugar cane in the Philippines are estimated to range from 2·9 in. in June and August to 6·3 in. in January and to total 53 in. of available moisture annually. Tables are given indicating the irrigation requirements of the crop, by months, in 5 areas.

3428. Alvim, P. de T.
La posibilidad de reconocer la necesidad de riego en maíz, algodón y caña de azúcar por medición de la apertura de los estomas. **(The possibility of determining the need for irrigation in maize, cotton and sugar cane by measuring stomatal apertures.)** [English summary ½ p.]
Reprint from *Agronomía, Lima*, 1956, **23**(87/88): 7-17, bibl. 11.

Drops of a solution comprising 80% of Nujol and 20% of n-dodecane, applied in the morning to the lower surfaces of the young leaves of sugar cane, penetrated the tissues and appeared as oily spots on the upper surfaces of those leaves with stomatal apertures as high as 90% of the maximum, but failed to infiltrate into those with more reduced apertures. Thus the appearance of spots indicated that there was no immediate need for irrigation. Soil moisture determinations in the immediate vicinity of the tested plants confirmed the results of the leaf infiltration tests. Xylol or kerosene could be used instead of n-dodecane, but the last named has the advantage of being non-toxic.

3429. DOBBS, P. J.
Water control in British Guiana.
World Crops, 1960, **12**: 457-60, illus.

Describes the system of irrigation and drainage in the coastal sugar cane growing area.

3430. LEVERINGTON, K. C.
The effect of saline conditions on the growth of sugar cane. Part 1. The effect of sodium chloride.
Tech. Commun. Qd Bur. Sugar Exp. Stats **1** to **4**, 1960, pp. 21-5, bibl. 3, illus.

Single-eye seed pieces of 2 varieties were grown in sand culture irrigated with a basal nutrient solution having an osmotic pressure of 0·5 atmosphere and also with the same solution to which NaCl was added to raise the pressure to 1·5, 2·5, 3·5 and 4·5 atmospheres. At the 3 highest pressures root and shoot growth was reduced. A table is given showing the moisture contents at which soils of various conductivity indexes will have a soil solution with an osmotic concentration of 2·5 atmospheres.

3431. SRINIVASAN, K., AND RAO, J. T.
Certain adaptive characters of genetic stalks of *Saccharum spontaneum* L. tolerant to water-logged conditions.
Curr. Sci., 1960, **29**: 321-2, bibl. 5, illus.

Certain clones of *S. spontaneum* grown under waterlogged conditions for 6 months developed a number of roots showing negative geotropism and considerable aerenchyma in the root cortex. Similar developments were observed in the variety Co.285 which is tolerant to waterlogging.—Sugarcane Breed. Inst., Coimbatore.

Sugar cane—nutrition.

(*See also* 3485.)

3432. BAVER L. D.
Plant and soil composition relationships as applied to cane fertilization.
Hawaii Plant. Rec., 1960, **56**: 1-153.

The whole issue is devoted to a review of the results of work carried out at the H.S.P.A. Experiment Station on the relationship between plant growth, fertilizer application and yields of sugar. There are 8 sections and 4 appendices containing supplementary statistical data and graphs.

3433. WILSON, J.
A guide to the use of fertilizers.
Bull. S. Afr. Sugar Ass. Exp. Stat. **13**, 1960, pp. 3.

Quantities and types recommended for sugar cane.

3434. SAMUELS, G., ALERS-ALERS, S., AND LANDRAU, P., JR.
The application of fertilizers in relation to the handling of sugarcane trash. [Spanish summary ½ p.]
J. Agric. Univ. P.R., 1960, **44**: 87-91, bibl. 3.

No significant differences in the yields of cane or sugar per acre in 3 subsequent ratoon crops were obtained when the trash from the plant cane crop was: aligned in alternate banks with shallow furrows opened in the clean banks; aligned as above without the furrows; left *in situ* with fertilizer applied to the base of the stool; or left *in situ* with fertilizer broadcast. Leaving the trash *in situ*, however, is not recommended for varieties that germinate poorly or for irrigated cane.

3435. GARGANTINI, H., AND OTHERS.
Restauração de solo para a cultura de cana-de-açúcar. I. Periodo de 1954/56. **(Soil recuperation in sugar cane cultivation. Period 1954/56.)**
Bull. Inst. Agron. Campinas, São Paulo, 1958, pp. 12, bibl. 10, illus., from *Trop. Abstr.*, 1961, **16**, Abstr. i173.

The treatments were: (1) control, (2) P + lime + leguminous cover, (3) PK + leguminous cover, (4) PK + lime + leguminous cover, (5) NPK, (6) NPK + lime, (7) NPK + leguminous cover, (8) NPK + lime + leguminous cover. The results obtained after the first harvest show: (1) a considerable increase in yield in all treated plots as compared with the control, (2) a less conspicuous increase in the P + lime + leguminous cover plots, (3) all treatments favourably influenced juice production, and (4) the largest increase in yield was in the potash treated plots.

3436. SHIUE, J. J.
Field experiments on the effects of green manure and nitrogenous fertilizer upon sugar cane. [Chinese, with English summary 1½ pp.]
Rep. Taiwan Sugar Exp. Stat., 1959, No. 20, pp. 41-56, bibl. 14.

About 30 tons/ha. was found to be the best amount of green manure to apply. The application of between 20 and 40 tons of green manure per ha. saved 38–62 kg. of N fertilizer per ha. in the plant crop and 61–85 kg. of N fertilizer per ha. in the first ratoon crop. In the second ratoon crop the residual effect of green manure from the 2 previous crops was equivalent to 33–60 kg. N fertilizer per ha. The relationships between green manure, nitrogenous fertilizer and yield are expressed mathematically for the 3 crops.

3437. SINGH, H., ADLAKHA, P. A., AND GILL, H. S.
Effect of nitrogenous manures, the method of their application and soil moisture in seed bed on plant growth and the yield of sugarcane.
Indian J. Sugarcane Res., 1960, **5**: 1-8, bibl. 17.

The results of trials carried out from 1952 to 1956 are summarized. All types of nitrogenous manures reduced cane germination, mohwa cake having the greatest effect, and application in the furrow caused a further reduction. Tillering, however, was increased and also the length of millable cane. The uptake of N from the soil increased in the manured plots, especially those given ammonium sulphate and groundnut cake. Quality was adversely affected by N, but cane yield was increased in 3 out of 4 years. The effects of soil moisture level at planting time were not significant.—Sugarcane Res. Stat., Jullundur.

3438. VARMA, S. C., AND VERMA, H. P.
Leaf nitrogen studies under different manurial and cultural practices in sugarcane.
Indian J. Sugarcane Res., 1960, **4**: 234-8, bibl. 8.

The nitrogen content of the leaf was found to be increased by: increasing the N dosage in the fertilizer; irrigation in the dry season; single as compared with fractional applications of N fertilizer; the application of N at planting rather than at tillering time; and the application of mineral as opposed to organic N. No relation between leaf-N level and yield was observed.—Sugarcane Res. Stat., Shahjahanpur, U.P.

3439. TABAYOYONG, F. T., AND ROBENIOL, M.
Yield response of sugarcane to fertilization.
Sugar News, 1960, **36**: 423-35, 438, bibl. 5.

Results from numerous field experiments are summarized. The critical levels of available P and K in the soils in the Victorias Milling District of the Philippines were found to be 30 and 100 p.p.m., respectively.

3440. GUMASTE, J. A., AND BARVE, D. B.
How far higher doses of phosphate would be beneficial to increase sugar yields.
Indian J. Sugarcane Res., 1960, **5**: 42-8, bibl. 6.

Large-scale trials showed no apparent overall benefit from application rates of phosphorus of up to 450 lb. P_2O_5 per acre; although some yields increased, maturity was delayed and the sucrose content was reduced.

3441. BHARGAVA, J. C., AND SEN, S. C.
Studies on the formulation of manurial schedule of sugarcane crop in respect of phosphate absorption through foliage analysis. Part III. Effect of different doses of phosphate at two levels of irrigation on its rate of absorption by sugarcane crop.
Indian Sugar, 1960, **10**: 457-9, bibl. 4.

No significant differences in leaf P content were found when superphosphate was applied at 20, 40, 60 and 80 lb. P_2O_5 per acre to sugar cane, which had received a basal dose of nitrogen and which was subsequently irrigated at either high or low rates. [For part II, see *H.A.*, 31: 1555.]—Nat. Sugar Inst., Kanpur.

3442. WALKER, B.
The effect of soil type on the response of sugar cane to potash fertilizer in British Guiana.
Potash Rev., Subject **27**, 1961, pp. 16, bibl. 4.

Trials were carried out on plant cane and first, second, third and fourth ratoons of the standard varieties B.41227 and B.37161. It was shown that the type of soil largely determined the yield responses to different levels of potash, and that on a sandy soil a 13% increase in sugar per acre was obtained with muriate of potash (4 cwt./acre). Increases of 2% and 5% were obtained on frontland clay with muriate of potash at 2½ and 5 cwt./acre. No economic yield responses were obtained on a saline sodium/magnesium clay soil.

3443. SOONG, P., AND OTHERS.
Field experiments on molasses used as a fertilizer on sandy soil. [Chinese, with English summary ½ p.]
Rep. Taiwan Sugar Exp. Stat., 1959, No. 20, pp. 9-39, bibl. 4.

Blackstrap molasses mixed with bagasse and filter press muds gave better yields of cane and sugar than molasses alone or molasses with added KCl. No harmful effects were noted on the growth of sugar cane even when the molasses had a high sugar content. Greater benefit was obtained from molasses used as a fertilizer on spring planted cane and on ratoon cane than on autumn planted cane.

Sugar cane—diseases.

(*See also* 3391.)

3444. CLEMENTS, H. F., AND AWADA, M.
Multiple top in sugar cane.
Hawaii Fm Sci., 1960, **9**(1): 1-3, illus.

The development of abnormal sugar cane tops after years of heavy tasselling is described and possible causes are discussed.

3445. (KING, N. J.)
Chlorotic streak is major problem.
Aust. Sugar J., 1959, **51**: 239-40.

On low-lying wet areas in Queensland.

3446. Sturgess, O. W.
Studies with chlorotic streak disease of sugar cane. 1. Introductory nutrient solution studies.
Tech. Commun. Qd Bur. Sugar Exp. Stats **1** to **4**, 1960, pp. 15-19, bibl. 10.

See *H.A.*, 30: 2983 for another account.

3447. Antoine, R.
The thermotherapy of sugar cane plants infected with chlorotic streak disease.
Rev. agric. sucr. Maurice, 1960, **39**: 321-7, bibl. 21.

Heat treatment methods are discussed. The author notes the possible inhibition of the disease by insolation in the field.

3448. Lauffenburger, G.
La lutte contre la maladie de Fidji de la canne à sucre à Madagascar. (**Control of Fiji disease of sugar cane in Madagascar.**)
Rev. agric. sucr. Maurice, 1960, **39**: 198-219, bibl. 2.

A critical review of the campaign inaugurated in 1954 to contain this disease.

3449. Sigwalt, B.
La lutte insecticide contre *Perkinsiella saccharicida*, vecteur de la maladie de Fidji. (**Insecticidal control of *Perkinsiella saccharicida*, the Fiji disease vector**).
Rev. agric. sucr. Maurice, 1960, **39**: 229-36.

DDT, BHC, endrin and Metasystox were all effective in controlling this insect. Results are given of combined insecticidal treatment and roguing in various localities.

3450. Rabéchault, H.
Étude anatomique de galles observées sur les feuilles de canne à sucre dans le nord-ouest de Madagascar. (**An anatomical study of galls observed on sugar cane leaves in north-west Madagascar.**) [English and Spanish summaries 10 lines each.]
Agron. trop., Paris, 1960, **15**: 513-24, bibl. 10, illus.

Sclerenchymatous galls, due to Fiji disease, and parenchymatous galls, due to "pseudo-Fiji" disease, occurred on the same sugar cane variety, but in different areas. In the latter case the pathological cells contained no X bodies.

3451. Baudin, P.
Observations sur les nouvelles galles foliaires de la canne à sucre à Madagascar. (**Observations on the new sugar cane leaf galls in Madagascar**).
Rev. agric. sucr. Maurice, 1960, **39**: 220-8, bibl. 9, illus.

Thought to be similar in origin to the lesions produced by Fiji disease, these galls were also observed on species of *Pennisetum*, *Sorghum* and *Panicum*.

3452. Leu, L. S., and Bau, Y. S.
Mosaic disease resistance trial of sugar cane seedling varieties in the 1958-59 crop year.
[Chinese, with English summary ½ p.]
Rep. Taiwan Sugar Exp. Stat., 1958, No. 18, pp. 24-32, bibl. 2, illus.

Yellow-, short- and fine-stripe types of mosaic were inoculated into 79 seedling varieties. The infection percentages were found to be 30·25, 15·55 and 54·20, respectively, for the 3 types of mosaic.

3453. Chenulu, V. V.
Ratoon stunting disease of sugarcane—a review.
Indian J. Sugarcane Res., 1960, **5**: 59-62, bibl. 29.

3454. M[ungomery], R. W.
Ratoon stunting disease threatens a valuable variety.
Cane Grs' quart. Bull., 1960, **24**: 70.

Q.58 in the Plane Creek district of Queensland.

3455. Stevenson, G. C., and Walker, D. I. T.
Heat treatment effects on two sugar cane varieties in Barbados.
Int. Sugar J., 1958, **60**: 251-3, bibl. 4.

Heat treatment for the control of ratoon stunting disease in B.37161 and B.41211 resulted in increased arrowing and reduced yields.—B.W.I. Cent. Sugar Cane Breed. Stat.

3456. Rangaswami, G.
Studies on two bacterial diseases of sugarcane.
Curr. Sci., 1960, **29**: 318-19, bibl. 7, illus.

Alternate hosts for *Xanthomonas rubrilineans* and *X. vasculorum*.

3457. d'Emmerez de Charmoy, D.
Un aspect imprévu de la gommose à la Réunion. (**An unforeseen aspect of gummosis in Réunion**).
Rev. agric. sucr. Maurice, 1960, **39**: 229-36.

The new outbreak of gummosis in Réunion, following a cyclone in 1958, after 20 years' quiescence is characterized by differences in varietal resistance, in geographical distribution and in the equilibrium between the primary and secondary forms of infection, the foliar form being exceptional in size and intensity. The introduction of an alien bacterial strain is considered to be the cause of the outbreak.

3458. Hughes, C. G.
Leaf scald south of Townsville.
Cane Grs' quart. Bull., 1960, **24**: 62-3, illus.

Notably on Q.63; control by roguing and field sanitation.

3459. Rivera, J. R.
Control of downy mildew of sugarcane.
Philipp. Sugar Inst. Quart., 1960, **6**: 66-71, bibl. 18, from *Trop. Abstr.*, 1961, **16**, Abstr. i177.

In preliminary tests of varietal susceptibility by artificial inoculation [with *Sclerospora sacchari*] the varieties H.44-3098, P.O.J.2878, Co.290 and P.O.J.2883 became heavily infected. Control measures consist of pre-planting treatment with fungicides, planting selected, disease-free material and roguing and burning diseased plants. Alternate host plants, such as *Saccharum spontaneum*, should be destroyed.

3460. Singh, S., and Singh, N.
Preliminary spraying trials with fungicides against red rot.
Indian J. Sugarcane Res., 1960, **4**: 248-9, bibl. 6.

Perenox 2% and Fytolan 0·5% were not sufficiently effective.

3461. Cross, W. E.
Studies on the sugar cane smut in Tucumán.
Int. Sugar J., 1960, **62**: 239-42, 271-4, bibl. 3.

Control of smut in Tucumán has been sought by the replacement of susceptible by resistant varieties (which are listed), crop rotation with 2-year intervals between cane crops and disinfection of planting material by hot water treatment. Details are given of the crop losses caused by smut.

3462. Singh, H., Singh, S., and Singh, N.
Preliminary studies regarding the effect of cultural methods on the incidence of sugarcane smut in the Punjab.
Indian J. Sugarcane Res., 1960, **5**: 34-7, bibl. 9.

Planting in dry soil followed by immediate watering tended to increase the incidence of smut (*Ustilago* spp.), as did planting in the 2nd half of March compared with April. No differences were found in the susceptibility of setts from upper, middle or lower parts of cane stalks.—Sugarcane Res. Stat. Jullundur.

Sugar cane—pests.

(*See also* 3449.)

3463. Hu, C. H., and Chu, H. T.
Preliminary report of an investigation on nematodes in a sugar cane field in Taiwan. [Chinese, with English summary ¾ p.]
Rep. Taiwan Sugar Exp. Stat., 1959, No. 19, pp. 35-51, bibl. 12, illus.

Nematodes of 12 genera were isolated; no control measures are mentioned.

3464. David, H.
On the host range of the root-knot nematode.
Indian J. Sugarcane Res., 1960, **5**: 56-7, bibl. 5.

A note on *Meloidogyne javanica* in weeds of sugar cane fields and other plants.

3465. Chu, H. T., and Tsai, T. K.
Study on the effect of soil fumigation on the growth of sugar cane. II. [Chinese, with English summary 1 p.]
Rep. Taiwan Sugar Exp. Stat., 1959, No. 20, pp. 73-89, bibl. 13, illus.

Plant height, number of tillers per plant, length and number of millable stalks and final yield were all increased by soil fumigation. Better results were found with spring planting than with autumn planting, and sandy soils showed the most improvement. Ortho-fume 85, DD, formalin and Chlorofin, 22, in order of effectiveness, all increased yields. These chemicals, except formalin, reduced the nematode population in the soil, but their influence on vigour could not be attributed solely to this effect. [For earlier work, see *H.A.*, 29: 3043.]

3466. Prasad, S. K.
A new beetle pest of sugarcane in Bihar.
Indian J. Sugarcane Res., 1960, **4**: 246-7, illus.

Heteronychus sp. damages stem bases; for control endrin, DD, paradichlorobenzene, EDB, parathion and CS_2 seem promising.—Sugarcane Res. Inst., Pusa.

3467. Chapman, L. S.
Lindane applicator for greyback cane grub control.
Cane Grs' quart. Bull., 1960, **24**: 44-6, illus.

The Nuttall attachment for tractor operation is described; this is capable of applying 13–20 gal. per acre at 20 p.s.i. according to the size of nozzle used. Lindane spray is preferable to BHC dust as regards cost, ease of application and effectiveness.

3468. Ahmad, M.
Plant protection by aeroplanes—its scope and development in East Pakistan.
Agric. Pakist., 1960, **11**: 63-74, bibl. 2.

Effective and economical for borer control in sugar cane.

3469. U.S. Department of Agriculture.
The sugarcane borer: how to control it.
Leafl. U.S. Dep. Agric. **479**, 1960, pp. 8, illus.

Cultural practices recommended to reduce *Diatraea saccharalis* infestation include the selection of resistant varieties and borer-free planting material, breaking old fields in autumn or early spring, harvesting infested cane as early as possible, cutting cane close to the ground, burning all trash, and shaving infested summer- or autumn-planted cane in the winter and burning the plants. The insecticide recommended is 2% granular endrin applied 4 times at 12 lb. per acre at 14-day intervals ending at least 45 days before harvest.

3470. David, H., and Ranganathan, V.
Influence of internode borer on the quality of juice in sugarcane.
Indian J. Sugarcane Res., 1960, **4**: 209-12, bibl. 5.

Although no significant loss of quality due to attack by *Proceras indicus* was observed on a field scale, individual canes showed loss of quality when more than 10% of their length was damaged, and this loss was enhanced by secondary infections.—Cent. Sugarcane Res. Stat., Cuddalore.

3471. David, H., and Ranganathan, V.
Variations in juice quality in top-borer-affected canes.
Madras agric. J., 1960, **47**: 201-5, bibl. 2.

Studies were made of variation in juice quality from varieties Co.419, Co.449 and Co.527 attacked by *Scirpophaga nivella* as related to variety and time of harvest. Varietal differences were not found, but canes attacked up to the ninth month were found to be of lower quality, whereas those affected later showed no deterioration. Top borer attack induced early maturity in fully grown canes.—Cent. Sugarcane Res. Stat., Cuddalore.

3472. Chang, H., and Shih, C. Y.
A study on the leaf midrib structure of sugarcane as related to resistance to the top-borer (*Scirpophaga nivella* F.) [Chinese, with English summary 1 p.]
Rep. Taiwan Sugar Exp. Stat. 1959, No. 19, pp. 53-66, bibl. 15, illus.

The thicknesses of the lower and upper epidermes of the cane leaf midrib are positively correlated with each other and negatively with the amount of borer damage. There was also a close positive relationship between the density of the parenchymatous cells in the midrib and the degree of resistance to top borers. There was a high negative correlation between the thickness of the upper epidermis and the diameter of the parenchymatous cells in the cane leaf midrib.

3473. Venkatraman, T. V., and Sharma, G. R.
A note on the natural control of the sugarcane mite *Oligonychus indicus* (Hirst).
Curr. Sci., 1960, **29**: 313-14, bibl. 3.

An outbreak largely controlled by the coccinellid beetle *Stethorus pauperculus*.

3474. King, N. J.
The problem of ratoon failures.
Aust. Sugar J., 1958, **50**: 73-7.

Among the causes of ratoon failures are infestations by *Rhyparida* larvae, which can be controlled by BHC and aldrin, and by soldier fly grubs, control of which had not yet been achieved.

3475. Butani, D. K., and Hashmi, M. H. A.
A note on the chemical control of *Tanymecus sciurus* Oliver (Curculionidae : Coleoptera), a minor pest of sugarcane.
Indian J. Sugarcane Res., 1960, **5**: 38-41, bibl. 6, illus.

Laboratory and field tests indicated that 5% dusts of BHC and aldrin at 20 lb. per acre were slightly more effective than a similar dosage of toxaphene. —Sugarcane Res. Inst., Pusa.

3476. Kalyanaraman, V. M., Narayanaswamy, P. S., and David, A. L.
Insecticidal control of termites attacking sugarcane.
Madras agric. J., 1960, **47**: 166-71, bibl. 10.

Good control of *Odontotermes obesus* was obtained with aldrin, dieldrin or heptachlor mixed with the soil at 1 lb. actual ingredient per acre prior to planting. Heptachlor is recommended because of its lower cost.

3477. S[tory], G. C.
Poisoning coots.
Cane Grs' quart. Bull., 1960, **24**: 42.

By inserting strychnine in cut sections of cane planted near the feeding grounds.

3478. Story, C. G.
Rats and their control.
Cane Grs' quart. Bull., 1960, **24**: 40-2.

By using baits of phosphorus, golden syrup and flour spread on bread, or a proprietary thallium sulphate preparation.

3479. Chapman, L. S.
Wallaby deterrents.
Cane Grs' quart. Bull., 1960, **24**: 47-8, illus.

Sprinkling the young cane and surrounding soil with blood and bone meal prevented wallaby damage for 4 weeks.

Sugar cane—sugar and other organic constituents.

(*See also* 3565.)

3480. Bieleski, R. L.
The physiology of sugar-cane. III. Characteristics of sugar uptake in slices of mature and immature storage tissue. IV. Effects of inhibitors on sugar accumulation in storage tissue slices.
Aust. J. biol. Sci., 1960, **13**: 203-20, bibl. 37, and 221-31, bibl. 18.

Sugar uptake took place in 2 stages. The first, dependent on external sugar concentration, was a movement into the apparent free space, the second an active accumulation process. Accumulation occurred against a 10–100-fold concentration gradient and was associated with a 30–40% increase in respiration. There was no starch synthesis, sucrose was not hydrolysed prior to accumulation, and sucrose uptake inhibited glucose uptake.

Mature tissue slices showed little or no ability to accumulate sugar. The behaviour of the slices towards inhibitors was similar to that of other transport mechanisms, but they were more sensitive than most plant tissues. There was no specific sensitivity to phloridzin. Results suggest that sugar is retained in immature storage cells by the continuous operation of a metabolic storage mechanism rather than by an impenetrable barrier to diffusion. [For part II, see *H.A.*, 29: 943.]—Univ. Sydney.

3481. Sastry, S. K., and Venkatachari, A.
Juice quality of sugarcane—a review.
Indian J. Sugarcane Res., 1960, **5**: 17-27, bibl. 231.

The effects of variety, planting material, several environmental factors and harvesting methods.

3482. Sen, S. C.
Selection of cane fields in succession of ripening.
Int. Sugar J., 1960, **62**: 179-81, bibl. 13.

Reasonably accurate estimates of the maturity of plots of sugar cane, not exceeding ½ acre in area, can be obtained in the field by use of a hand refractometer measuring the Brix of a composite sample drawn from the middle internodes of 4–5 clumps with a Sen puncturing needle.—Nat. Sugar Inst., Kanpur.

3483. Ranganathan, V., and Raja, R. P.
Note on the position of bud, affecting the juice concentration, within the internode.
Indian J. Sugarcane Res., 1960, **5**: 57-8, bibl. 3, illus.

The Brix reading on a hand refractometer was found to be highest when the sample was taken from the centre of an internode longitudinally below a bud, and lowest when there was no bud directly above or below the sampling point.—Cent. Sugarcane Res. Stat., Cuddalore.

3484. Khan, A. R., and Basappa, K. S.
Studies in sugarcane leaf sheath moisture with reference to juice quality.
Indian J. Sugarcane Res., 1960, **5**: 54-5, bibl. 6.

A high negative correlation was found between the percentage moisture in the leaf sheath and the sucrose content of the juice during the period October 1958 to January 1959.—Indian agric. Res. Inst., New Delhi.

3485. Raheja, P. C.
Relationship of chemical composition of cane varieties and sugar recovery.
Indian J. Sugarcane Res., 1960, **4**: 202-8, bibl. 29.

Published work on the influence of chemical composition, particularly mineral and nitrogen contents, on sugar recovery is reviewed. It is observed that the high phosphate and sulphate contents plus low chloride content of north Indian raw juice leads to easy clarification, whereas the low phosphate content in southern India presents difficulties. Bagasse with a high fibre content is to be preferred both for milling and fuel.—Indian agric. Res. Inst., New Delhi.

3486. Stevens, R.
The phenolic constituents of sugarcane.
Int. Sugar J., 1959, **61**: 199, bibl. 10.

p-Coumaric, ferulic, sinapic and possibly caffeic acids.

3487. Singh, H. P., and Sen, S. C.
A quick and rapid method for the estimation of wax in sugar cane.
Indian J. Sugarcane Res., 1960, **5**: 55-6, bibl. 3.

Elution with cold ether sulphuric acid.

3488. Vlitos, A. J., and Cutler, H. G.
Plant growth regulating activity of cuticular waxes of sugarcane.
From abstr. in *Plant Physiol.*, 1960, **35** (Suppl.): vi.

Waxes from the variety B.41227 promoted the elongation of *Avena* internode sections at all concentrations from 500 to 0·0005 p.p.m.

Sugar cane—harvesting, handling and disposal of surplus crops.

3489. Riollano, A.
New sugarcane harvester tried in Puerto Rico.
Sugar y Azúcar, 1957, **52**(7): 30, illus.

Tractor-mounted and handling 30–35 tons per hour.

3490. Mazery, G.
Transport et chargement de cannes. **(Cane transport and loading.)**
Rev. agric. sucr. Maurice, 1960, **39**: 191-7.

Methods, equipment and costs in Mauritius.

3491. Tromp, L. A.
Cane storage.
Int. Sugar J., 1960, **62**: 39-41, 66-9, illus.

Various methods of storing cane overnight and for longer periods are discussed, including storage in wagons, silos and under light-weight sheds. The equipment used for this purpose is described in detail.

3492. Venkatapathi, T., and Rao, N. V. M.
Jaggery (gur) making in Andhra Pradesh.
Indian J. Sugarcane Res., 1960, **4**: 220-3, bibl. 11.

A review of work done at the Sugarcane Research Station, Anakapalle, to improve quality.

3493. Rao, P. V. S., and Rao, T. M.
Storage of jaggery (gur)—some of the progressive indigenous methods in vogue in Andhra Pradesh.
Indian J. Sugarcane Res., 1960, **5**: 28-33, bibl. 2.

3494. Smith, N. M.
The Burns vertical cane slasher.
Cane Grs' quart. Bull., 1960, **24**: 60-1, illus.

This implement, developed for chopping up standing, unwanted cane crops, can also be adapted for stubble shaving, weeding and cleaning ditches. It consists of 2 large, vertical, hooded blades driven from the p.t.o. in the rear of the tractor in a plane at right angles to the direction of travel.

3495. Chapman, L. S., and Hucknall, J. A.
Destruction of standover cane in the Burdekin district.
Cane Grs' quart. Bull., 1960, **24**: 64-5, illus.

By pushing over with a bulldozer blade in front of the tractor and breaking up with a Cambridge roll behind the machine, and burning the residues 3–4 months later.

Tea—general.

3496. Tea Research Institute of Ceylon.
Annual Report for the year 1959, 1960, pp. 97, bibls.

Agricultural chemistry: The use of gypsum in one experiment led to a significant yield increase. Cases of Fe and K deficiency and Mn toxicity responded to the appropriate treatments. *Biochemistry:* Free volatile substances in both green leaf and black tea were found to increase during the dry season in the S.W. monsoon zone. *Entomology:* Reasonable control of scarlet mite was obtained with 4% Karathane dust; Kelthane and endrin showed promise for the control of yellow mite; DDT (0·1%) and malathion (0·1%) as emulsions and DDT (0·2%) w.p. were effective against nettle grubs. *Nematology:* As a result of many years of selection a dozen clones have been developed which are markedly resistant to, or tolerant of, meadow nematode. *Plant pathology:* Reasons are advanced for regarding oil spot disease as a non-parasitic, physiological disorder. *Plant physiology:* Dome plucking yielded consistently less, and periphery plucking consistently more, than normal plucking. From the evidence obtained it appeared that limited fish-leaf plucking was advantageous, but only on bushes in good health. In fields earmarked for replanting continuous fish-leaf plucking over 3 years could help to offset the cost of replanting. In a shade experiment the highest plant weights and leaf areas were recorded at light intensities of between 60 and 100%.

3497. Tea Research Institute of East Africa.
Annual Report for the year 1959, 1960, pp. 40.

Agricultural department: In the NPK factorial experiment response to N in the 4th year was again linear up to 80 lb. per acre, but no extra response to a further 40 lb. has yet been shown. At Mufindi the response to 30 lb. P_2O_5 was significant for the 2nd year. Urea, with or without S, proved a less effective source of N than sulphate of ammonia at Kericho. Hard plucking, except in the final year of the pruning cycle, was found to reduce growth. *Plant pathology:* It appears probable that 2,4,5-T used as an arboricide could replace ring barking to kill surplus grevillea trees while at the same time starving out *Armillaria mellea. Chemical department:* A case of dieback in grevillea shade trees was found to be due to boron deficiency.

3498. McWilliam, M. D.
The Kenya tea industry. Part 4. African tea growing.
E. Afr. Econ. Rev., reprinted in *Tea*, 1960, **2**(1): 23-4, bibl. 2.

Problems and progress of tea growing on African smallholdings [for parts 1–3, see *H.A.*, 31: 1580].

Tea—propagation and culture.

(*See also* 3496, 3497, 3516, 3523.)

3499. G[lover], P. M.
Tea seed.
Ser. Tea Res. Inst. Tocklai **152**, 1960, pp. 5.

Collection, grading, selection, testing and packing.

3500. Hutchinson, M. T.
Fumigating nurseries.
Tea Quart., 1960, **31**: 119-20, bibl. 2.

A simple method outlined, in which fumigant is applied in trenches by means of a jar with a perforated cap.

3501. Jayawickrama, D. S.
Some results of vegetative propagation with TRI 2026.
Tea Quart., 1960, **31**: 81-2.

Test pluckings of this clone have yielded 16,000 lb. per acre per annum, i.e. about 3,850 lb. of made tea.

3502. Watt, A.
Vegetatively propagated tea plants: growing and transplanting economically.
Tea Quart., 1960, **31**: 53-5, illus.

The methods used on one estate are described and the costs analysed.

3503. Dutta, S. K.
Use of polyethylene film tubes for planting of tea seed, tea cuttings and shade tree seeds.
Two and a Bud, 1960, 7(3): 8-10.

Methods of using these tubes described and advantages enumerated.

3504. Walsh, N. M.
Soil conservation practices on Nyanza tea estates.
Tea, 1960, **2**: 35-9.

Methods in use and recommendations for moderate and steep slopes.

3505. Gokhale, N. G.
Soil acidity for tea.
Two and a Bud, 1960, **7**(3): 17-19.

The limits of soil pH within which tea will make good growth in north east India range from 3·2–4·8 in a peaty soil to 4·6–5·8 in a light sand.

3506. Hanapi, M. M., and Reesinck, J. J. M.
The temperatures of leaves in the sun.
Arch. Tea Cult., 1959, **20**: 197-201, bibl. 10.

Thin leaves, including tea leaves, in sunshine gave thermocouple readings averaging 4° C. above the ambient air.

3507. Harler, C. R.
Shade for tea.
World Crops, 1960, **12**: 464, 466, illus.

Work in N.E. India and elsewhere briefly reviewed.

3508. Macalpine, R. I.
Some factors affecting choice of shade tree species for tea.
Two and a Bud, 1960, **7**(3): 3-7.

Moderate canopy density, ease of establishment and nitrogen-fixation.

3509. D[utta], S. K., and G[lover], P. M.
Shade.
Ser. Tea Res. Inst. Tocklai **46/2**, revised 1960, pp. 6.

The results of experiments with shade and fertilizer treatments on tea are summarized. Details of recommended shade trees from the genera *Albizzia*, *Dalbergia*, *Derris*, *Gliricidia* and *Leucaena* are given. The application of more than 90–112 kg. N per ha. (80–100 lb. N/acre) on well shaded tea is not recommended.

3510. Christie, R. K.
Green manure and shade trees.
Tea Quart., 1960, **31**: 121-2, bibl. 3.

Notes on the influence of shade trees on pest and disease control and their use in providing organic matter.

3511. Gokhale, N. G.
Estimating the probable change in yield with time, on altering the level of manuring of tea.
Emp. J. exp. Agric., 1960, **28**: 315-26, bibl. 3.

The manner in which yields change in the years immediately following an alteration in the level of manuring of unshaded mature tea grown in north-east India has been investigated. Explaining the theoretical basis on which the equation is derived, the author now proposes a general equation, which is applicable to all types of manures and fertilizers, to estimate the probable change in yield with time when the level of manuring is either increased or decreased in and from a given year. Data from four manurial trials carried out at the Borbhetta field-experimental station for periods varying between 6 and 11 years are quoted, and it is shown that the equation fits the data well. The shapes of the yield/time curves are entirely different for cattle manure and for inorganic fertilizer treatments. An "S" type of curve is possible only with cattle manure (which has low availability but a high residual effect) treatment, whereas inorganic fertilizers (which have high availability but low or negligible residual effect) give curves of the "continuously falling" type. The method of obtaining "the least square" solution for the equation is described in an appendix. [From author's summary.]—Tocklai exp. Stat., Cinnamara, Assam.

3512. Barua, D. N., and Deb, S. B.
Variation in the nitrogen content of tea leaves.
J. Sci. Food Agric., 1960, **11**: 366-70, bibl. 5.

Leaves from several clones were analysed. In one clone over a period of 15 years the yield increased with N manuring up to 135 kg. N per ha. A relationship was also found between the percentage of N in plucked shoots and (1) the amount of N fertilizer applied, and (2) the yield. As long as the leaf continued to expand the N content per unit area progressively decreased, but once fully expanded there was no further change in the N content. However, on a weight basis there was a progressive fall in the N content of ageing leaves. The leaf-N content varied with the clone, the position of the tea bush in a plot and the date of plucking. Sampling should be confined to a particular leaf in a specified position on the stem.—Tocklai exp Stat., Cinnamara, Assam.

Tea—diseases, parasites and pests.

(*See also* 1839, 3496, 3497, 3510.)

3513. de Weille, G. A.
Blister blight control in its connection with climatic and weather conditions. [Indonesian summary 1¼ pp.]
Arch. Tea Cult., 1959, **20**: 1-116, bibl. 47.

The article gives a comprehensive review of the disease, particularly in relation to Indonesia. The extreme dependence of the fungus, *Exobasidium vexans*, on climatic factors such as R.H. and insolation when outside the host tissues is stressed, and various forecasting systems based on weather conditions are outlined. It is claimed that the author's system, called the S.V.R. (sun valuation rate) system, provides the most accurate prediction. This is based on weighting the days according to the deficiency of sunlight occurring after the last spraying schedule. [See also *H.A.*, 31: 1613.]—Gen. Exp. Stat., A.V.R.O.S., Medan.

3514. REESINCK, J. J. M.
Note on de Weille's blisterblight forecast system.
Arch. Tea Cult., 1959, **20**: 203-5, bibl. 1.

A suggested simplification [see previous abstract].

3515. MULDER, D., AND DE SILVA, R. L.
A forecasting system for blister-blight control, based on sunshine records.
Tea Quart., 1960, **31**: 56-67, bibl. 2.

On 5 estates spraying against blister-blight was postponed when the total sunshine recorded for the previous 4 or 5 days exceeded 16 and 20 hours, respectively. The number of rounds saved ranged from 2 to 11, and no reduction in control was observed. [See also *H.A.*, 30: 3003.]

3516. DE WEILLE, G. A.
The adaptation of tea cultivation to the occurrence of blister blight. [Indonesian summary 1 p.]
Arch. Tea Cult., 1959, **20**: 161-92, bibl. 53, illus.

In view of the inhibiting effect of solar radiation on the pathogen the following recommendations are made: (1) shade should be removed completely, not thinned, and a ground cover of *Commelina nudiflora* should be established; (2) early tipping should be combined with clean weeding around newly-pruned bushes; and (3) hollow plucking should be practised, and, where marked susceptibility to blister blight exists, this should be preceded by hollow pruning.—Gen. Exp. Stat., A.V.R.O.S., Medan.

3517. DE WEILLE, G. A.
A treatise on chemical control of blister blight. [Indonesian summary ½ p.]
Arch. Tea Cult., 1959, **20**: 117-60, bibl. 35, illus.

Equipment, methods and preparations are reviewed. Spraying is stated to be more effective against severe attacks and dusting against mild attacks. Inorganic copper fungicides are preferred.—Gen. Exp. Stat., A.V.R.O.S., Medan.

3518. SARMAH, K. C.
Canker [of tea plants].
Two and a Bud, 1960, **7**(3): 21-2.

Discussed with special mention of *Nectria* sp., *Macrophoma theicola* and *Phomopsis* sp.; the chief cause in high-altitude gardens is sun scorch.

3519. GOODCHILD, N. A.
***Armillaria mellea* in tea plantations.**
Tea, 1960, **2**(1): 43-5, bibl. 5.

With reference to the killing of forest and shade trees by ring-barking or by the use of 2,4,5-T, thereby depleting the starch reserves.

3520. MULDER, D.
Planting on *Poria*-infected areas.
Tea Quart., 1960, **31**: 106-9, bibl. 9, illus.

It is suggested that, where a soil is known to be infected with *Poria hypolateritia*, ground cleared for tea should be kept under Guatemala grass for a longer period than usual and heavy dressings of organic manure should be applied to stimulate the growth of saprophytic fungi, such as *Trichoderma viride*, which are antagonistic to *Poria*. *T. viride* is also more resistant to soil disinfectants than *P. hypolateritia*, and Nemagon is recommended for this purpose.

3521. S[ARMAH], K. C., AND G[LOVER], P. M.
Raghumala (*Loranthus* sp?).
Ser. Tea Res. Inst. Tocklai **153,** 1960, pp. 2.

Early treatment consists in removing affected branches of the tea bush. At later stages the parasite can be killed by cutting off the extruding stem 1½–2 in. above the point of emergence and treating the cut surface with a 5% common salt solution applied in an absorbent pad.

3522. D[AS], G. M., AND G[LOVER], P. M.
Cricket control.
Ser. Tea Res. Stat. Tocklai **78/1**, revised 1960, pp. 3.

Brachytrypes achatinus can be partially controlled by a pre-sowing treatment of the nursery beds with an aldrin or dieldrin spray or dust (2 lb. a.i. per acre) worked into the soil. Control can also be obtained by the introduction of BHC, DDT, Dieldrex, lindane, waste engine oil or paradichlorobenzene into the burrows, or by a poison bait of bran, insecticide and sugar.

3523. DAS, G. M.
Occurrence of the red spider, *Oligonychus coffeae* (Nietner), on tea in north-east India in relation to pruning and defoliation.
Bull. ent. Res., 1960, **51**: 415-26, bibl. 9.

Since the pest overwinters on old leaves and on small, basal leaves, the extent of the spring attack depends largely on the extent of previous pruning. Cleaning out also reduces subsequent attack, and defoliation ensures almost complete freedom from attack. Plucking height has no observable effect on red spider attack. Dusty roadside bushes have more lateral branches and fewer predators and therefore suffer badly from red spider. Abandoned tea suffers worst in the first year after abandonment, and subsequently less so as the trees develop. In tea seed gardens the red spider is virtually absent. [See also *H.A.*, 30: 1422 and 4583.]—Tocklai Exp. Stat., Cinnamara, Assam.

3524. WIGHT, W., AND BORA, P. C.
Botanical basis of red-spider resistance in tea.
Curr. Sci., 1960, **29**: 395-6, bibl. 8.

In a factorial experiment a significant negative correlation was found between the degree of red spider (*Oligonychus coffeae*) infestation and the "phloem index", which is the measure of the frequency of cells containing calcium oxalate in the phloem parenchyma. This frequency was also associated with hybridity between the varieties *sinensis* and *assamica.*—Tocklai Exp. Stat., Assam. and Assam agric. Coll., Jorhat.

3525. Das, G. M.
Are scale insects a serious menace to tea in Darjeeling?
Two and a Bud, 1960, **7**(3): 11-13, bibl. 1.

Eriochiton theae and *Phenacaspis manni* are considered responsible for much die-back and secondary fungal infection. Shalimar tar oil emulsion and Ovicide are recommended for control in the cold weather after removal of lichens and mosses by friction or painting with 1–2% caustic soda solution.

3526. Judenko, E.
Shot-hole borer (*Xyleborus fornicatus* Eich.) and clones.
Tea Quart., 1960, **31**: 72-5, bibl. 5.

Although none of the 35 clones examined was free from borer injury, TRI 2023 was only lightly infested and may be resistant, TRI 2026 may be tolerant with some resistance, and TRI 2024, though consistently heavily infested yet yielding satisfactorily, may be tolerant.

3527. Elmer, J. L., and Smith, R. G.
Experiments on the control of two weevils attacking tea nurseries.
Tea, 1960, **1**(4): 31-3, bibl. 3, illus., and **2**(1): 27, 30-2, bibl. 4.

A high mortality of adults of *Nematocerus sulcatus* and *Aperitmetus brunneus* was obtained over a period of 4 months, with some reduction also of root damage by the larvae, with lindane emulsion applied at 10 lb. a.i. per acre. No observable damage to tea seedlings was occasioned by the treatment, whereas crude BHC at 5 lb. a.i. per acre was markedly phytotoxic.

3528. Glover, P. M., Das, G. M., and Mukherjee, T. D.
Pesticides and the tea industry in north east India with special reference to toxic hazards to operators and consumers and to tainting.
[*Publ. Indian Tea Ass., Tocklai*, 1960], pp. 7.

Tea—plucking, manufacture and composition.

(*See also* 1846, 3496.)

3529. Visser, T.
Plucking practices in relation to maintenance foliage.
Tea Quart., 1960, **31**: 38-52, bibl. 20.

Both the short- and long-term effects of plucking as soon as the shoot has 2 leaves and a bud above the so-called fish leaf (fish-leaf plucking) compared with normal or single-leaf plucking (when the shoot has 3 leaves and a bud above the fish leaf, one leaf remaining unplucked) are reviewed. Fish-leaf plucking always yields a bigger crop but its long-term effects are injurious, and it should not be carried out for longer than one pruning cycle, except where the bushes are subsequently to be grubbed. It can be used in the dry season, followed by normal plucking in the main season.

3530. Visser, T.
Estimations of organic matter supplied by regularly plucked tea bushes.
Tea Quart., 1960, **31**: 101-5, bibl. 6.

Normally plucked bushes were found to return about 2 tons of dry organic matter to the soil per acre per annum. Limited fish-leaf plucking reduced this figure by less than 20%, but under continuous fish-leaf plucking the amount fell to 56% after the 6th cycle.

3531. Barua, D. N.
Effect of age and carbon-dioxide concentration on assimilation by detached leaves of tea and sunflower.
J. agric. Sci., 1960, **55**: 413-21, bibl. 20.

The reduced rate of photosynthesis of the tea leaf, immediately after excision, is due to stomatal closure. In mature detached leaves, kept well supplied with water in diffuse light or darkness and in a humid atmosphere, normal stomatal opening and maximum photosynthetic rates were obtained between 12 and 30 hours from excision. At 25° C. and under 32 klux light intensity there was no change in the photosynthetic rates of tea leaves in 1 and 2% initial, and in 0·2% final, CO_2 concentrations. There were indications that CO_2 concentrations below 1·0% might be rate-limiting for certain tea leaves assimilating under low light (4 klux). In tea the photosynthetic capacity develops fully after the leaf reaches half its final size. [From author's abstract.]—Tocklai exp. Stat., Cinnamara, Assam.

3532. Child, R.
Elementary notes on tea manufacture. Part I. Withering.
Pamphl. Tea Res. Inst. E. Afr. **18**, 1960, pp. 16, bibl. 10, illus.

The theory of withering is explained and the construction and operation of several mobile tat, drum and trough withering installations are described. Hygrometric tables for use at 5,000 and 7,500 feet elevation are appended.

3533. Chanda, N. B.
The chemistry of tea.
Reprint from *J. Univ. Gauhati*, 1959, **10**(2): 77-84, bibl. 23.

Tea polyphenols are described, their structure explained and their influence on tea quality discussed.

3534. DŽEMUHADZE, K. M.
Geographical variability of tea raw material. [Russian, with English summary ¼ p.]
Izv. Akad. Nauk S.S.S.R., Ser. biol., 1960, No. 3, pp. 389-400, bibl. 21.

Analyses of samples of raw tea from Georgia, Azerbajdžan and the Krasnodar region showed considerable variation, particularly in the tannin and catechin fractions, and this is ascribed to metabolic changes induced by different growing conditions.

3535. RAMASWAMY, M. S.
Copper in Ceylon teas.
Tea Quart., 1960, **31**: 76-80, bibl. 6.

The increasing use of copper fungicides in tea gardens has led to a marked increase in the Cu content of the leaf, and figures above 150 p.p.m. have been recorded. The Cu content of the liquor made therefrom, however, is lower than that in many other beverages and foods.

Sundry crops.

(*See also* 3593.)

3536. SEN, P. K., AND BOSE, T.
Effect of growth substances on rooting of jack fruit (*Artocarpus integrifolia* Linn. F.) layerings.
Indian Agric., 1959, **3**: 43-7, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 60,950.

The effects of 1,000, 5,000 and 10,000 p.p.m. of IAA, IBA, NAA and MH in lanolin applied at the time of ringing in the middle of May and the middle of June are described. A significant increase was found in the percentage of layers rooting and the number of roots formed using the 3 growth substances, all of which gave better rooting with the June treatment. IBA gave optimum results with 5,000 p.p.m. and IAA and NAA with 10,000 p.p.m.; MH had an inhibiting effect on rooting.—Calcutta Univ.

3537. AYERST, G., AND BUDD, D.
Effect of moisture content on the storage of brazil nuts.
J. Sci. Food Agric., 1960, **11**: 390-6, bibl. 11.

Current practice in collection, handling and storage is described. Laboratory and field methods of determining moisture contents, the relationship between moisture content and R.H., and the effect of moisture content on respiration rate were investigated. In storage experiments deterioration was slow both at very low and very high moisture contents, whereas rather rapid spoilage occurred at intermediate levels. [From authors' abstract.]—Pest. Infest. Lab., Slough, Bucks.

3538. SARASOLA, L.
Cherimoya culture in Spain.
Yearb. Calif. Avoc. Soc., 1960, **44**: 47-51, illus.

Methods of propagation and growing as practised in the Almuñecar valley, Granada, with details of varieties, diseases, pests and marketing arrangements.

3539. JAUHARI, O. S.
A note on the regeneration of stem cuttings of "phalsa" (*Grewia asiatica*) as influenced by beta-indolebutyric acid.
Sci. and Cult., 1960, **26**: 144, illus.

Shoot cuttings gave 60% rooting when treated with 100 p.p.m. IBA solution for 24 hours, whereas the controls did not root.—Govt. agric. Coll., Kanpur.

3540. ARENS, K.
Sôbre a anatomia da semente do guaraná. **(On the anatomy of the seed of *Paullinia cupana*).** [English summary].
Publ. Inst. nac. Pesquisas Amazônia, Botânica, **2**, 1956, pp. 45, illus., from *Trop. Abstr.*, 1960, **15**, Abstr. h.3178.

Paullinia cupana occurs in the Brazilian Amazon region. The drink obtained from the plant is stimulating as it contains tetramethyl xanthine, which is chemically similar to caffeine. The fruits grow in clusters of 15–50, and each contains 1–3 seeds. Each part of the seed (pericarp, nut, kernel, etc.) is described. The histological elements of the seeds are always found in the powder obtained from them, thereby making accurate identification possible.

3541. MORTON, J. F.
The emblic (*Phyllanthus emblica* L.)
Econ. Bot., 1960, **14**: 119-27, bibl. 53, illus.

The tree, fruit composition, its use as a food including its special dietetic and medicinal value, other economic uses, propagation and culture are described.

NOTES ON BOOKS AND REPORTS.

Books.

(*See also* 3043.)

3542. CHILDERS, N. F.
Modern fruit science.
Horticultural Publications, Rutgers, The State University, Nichol Avenue, New Brunswick, N.J., 2nd edition, 1961, 9 × 6 in., pp. 891, bibls, illus., $7.50 U.S. possessions, $8.00 foreign.

This is the second edition of a book, which was first published in 1949 and which, as the preface indicates, is primarily designed for the use of students taking courses in fruit growing, though it is also hoped that it will be of value to the fruitgrower who wishes to keep up-to-date with recent developments. For the student this should prove an extremely useful book, covering as it does nearly every aspect of both tree and soft fruit growing in the U.S.A., including chapters on the harvesting and marketing of fruits. At the end of each chapter there is a useful list of other books and publications dealing with the same subject.

The introductory chapter raises some interesting points on the economic principles of fruit growing relative to the fluctuating general price level at which goods are bought and sold, and draws attention to the depressions which usually follow any major wars. It is suggested, therefore, that before anyone makes a long term investment in an orchard it would be as well to determine the present price level, whether it is high or low or whether it is going down. The economics and trends in production of different crops are a valuable feature right through the book.

Naturally, the apple crop receives most attention, and as the author points out knowledge of the basic principles relating to this crop serve as a sound foundation for the building up of knowledge of the other crops. Among aspects of the apple crop well covered are soil management and the use of fertilizers, and bud formation and pollination.

While this book is obviously designed for the American student, it does give a very comprehensive picture of the fruit growing industry in the U.S.A. for readers in other countries. The new edition has been brought up-to-date in most directions, but with a book of this kind, which cannot always be revised sufficiently often to keep pace with modern developments, the author may be rather conservative in his approach to recent trends. For example, following the growing interest in the production of "dwarf" trees in the U.S.A., reference is made to the use of Malling rootstocks for apples and pears. The information here, however, is not quite up-to-date, because, while it provides a list of the whole range of Malling stocks, including many now abandoned, no reference is made to the Malling-Merton rootstocks, though M.XXV released at the same time as the MM stocks is mentioned. In referring to the use of quince stocks for pear trees, mention is made of Quince D, but it is said it is too dwarfing for commercial use. Probably there is some confusion here with Quince C, which produces a dwarfing effect, whereas Quince D is largely incompatible with most pear varieties, though with the few with which it is compatible the growth is not dwarfing. There is scant reference to the use of herbicides in fruit crops, and, in fact, these only also receive a passing mention for use in cherries and strawberries.

There are useful references at the end of the book, including a list of scientific and other publications produced both inside the U.S.A. and in other parts of the world. The list of foreign agricultural experiment stations and colleges is also a useful one, though the information given for England is not quite complete, as no mention is made of the Ministry of Agriculture Experimental Horticulture Stations.

The book is well printed and lavishly illustrated, though it is not without some minor errors; for example Fig. 14 on page 116, where the acknowledgement to T. Wallace of Kent, England, should read "T. Wallace, Long Ashton Research Station, Bristol", and, similarly, for the photograph on page 821, where the acknowledgement should again be to Long Ashton Research Station, Bristol, and not Kent. F.A.R.

3543. COLLINS, J. L.
The pineapple: botany, cultivation and utilization.
Leonard Hill, London, and Interscience Publishers, New York, 1961, 9½ × 6 in., pp. 294, bibls, illus., 60s.

The publishers describe this book as a complete guide to the pineapple's history, botany, cultivation and uses and claim it to be the only book needed for its study, cultivation and commercial exploitation.

The first 24 pages deal with the early history of the plant, and the author concludes that its cultivation was widespread in Central and tropical South America by the 16th century. Extensive quotations are made from the writings of the Spanish explorer Oviedo, and a summary is given of the post-Columbian spread of the plant to St. Helena, Africa and tropical Asia.

The next hundred pages comprise a first-class account, in four chapters, of all botanical aspects of the crop, including taxonomy and ecology, morphology and anatomy, a description of varieties and their distribution and an account of its cytology, genetics and breeding techniques. As one would expect from the author this section is thoroughly authoritative and will be of great value to all plant breeders. Naturally, perhaps, most attention is paid to the Cayenne variety as cultivated in Hawaii, but then, of course, this bias also reflects where most research has been done. However, much of the information which is summarized in the excellent tables has more extensive application.

Part II, of 92 pages, is devoted to cultivation and provides chapters on climate and soil, cultural methods, diseases and pests and environmental influences. The long chapter on cultural techniques is perhaps the least satisfactory in the book, as the descriptions are basically superficial, and, even on his home ground in Hawaii, the author makes no attempt to give any fundamental guide to fertilizer practice. Beyond a passing reference to a potash : phosphorus ratio of about 12 to 1 there is no mention of leaf analysis. One looks in vain, both here and in the bibliography, for a reference to the classic 1936 paper by Follett-Smith and Bourne [*H.A.*, 6: 401] on the uptake of minerals by pineapple plants at different stages of growth, and this glaring omission is not even partially filled by reference to later research elsewhere. A search in the subject index proved equally fruitless since "Nutrition" referred only to three lines of speculation on future trends. It is perhaps not the author's fault that the publishers should describe this as "the definitive textbook", but a chance has been lost to round off this otherwise excellent work by collaboration with a soil chemist and agronomist. As it is, there is no mention of the important effect of potash on the sugar and acid contents of the fruit. The importance of the minor elements iron, zinc and copper receives brief mention in several sections of the book, but careful search is required for guidance on dosages and concentrations. Certainly a grower might well be puzzled, on p. 137, by reference to a spray containing "liquid iron".

There is a short and interesting section on the use of hormones to initiate flowering and control fruit size and, on p. 148, a most useful chart to illustrate the relationship between plant spacing, within and between rows, and the number of plants per acre, allowing for different proportions of land under roads and ditches. With any three of these data known the fourth can be read off the chart. Growers in many countries will be grateful for this aid which does not appear to have been published before.

The important chapter on diseases and pests is valuable in so far as the author deals with Hawaii, but less satisfactory for other countries. Johnston's identification of the causal organism of bacterial heart rot and fruit collapse [*H.A.*, 28: 901 and 3108] receives no mention, nor does the green die-back which is caused by copper deficiency on the peat soils of Malaya. There appears to be a heading missing, or perhaps more, on p. 195, as we find ourselves dealing with insect pests in South Africa under the heading "Fruitlet core rot".

The short chapter on the influence of environmental factors is excellent and will be read by workers in many fields. It seems wrong, however, that it is only here, in a section on salt water spray damage, that we find a reference to leaf damage by chlorine, and it is hoped that growers will infer from this that potassium chloride is an unsuitable fertilizer.

Part III, on utilization, contains short chapters on cannery techniques and other methods of preservation and on by-products, including sugar-syrup, alcohol, yeasts, cattle foods, fibres, citric and other organic acids, waxes, sterols, starch and proteases. The general reader will find all this of interest, but the food technologist will look in vain for any reference to the preparation of juice concentrate by low temperature evaporation under reduced pressure.

Finally, there is a short and interesting appraisal of the future of the pineapple industry, and demographic evidence is quoted for the conclusion that two-thirds of the present world population can be eliminated as possible future purchasers of a luxury food like canned pineapple.

There is a useful bibliography of 180 sources with dates from 1520 to 1957, a subject index of uneven value and an author index. The review copy had a handsome hard-wearing cloth cover, but casing-in had been completed in a shoddy manner and one end-paper tore in half after a few days of careful handling. It is to be hoped that this will be rectified in future issues.

In conclusion, this book is invaluable to all botanists concerned with pineapples, and growers will read it with profit. The general reader will also find most chapters of great interest, although sometimes the unnecessary use of terms like "flower anthesis" and "fruit ontogeny" may act as a deterrent. The illustrations are mostly very good, and, with more adequate binding, it would be excellent value for £3. E.F.A.

3544. COMMONWEALTH BUREAU OF SOILS.
Bibliography of soil science, fertilizers and general agronomy 1956-1959.
Commonwealth Agricultural Bureaux, Farnham Royal, 1960, 9 × 6 in., pp. 762, £4.

The comprehensive list of references, which comprises the main part of the volume, is classified by a new decimal system which is outlined in the first few pages. Each reference includes authors' names, title and journal source. There are also author and subject indexes.

3545. HILL, J. B., AND OTHERS.
Botany. A textbook for colleges.
McGraw-Hill Book Co. Inc., New York, Toronto, London, 3rd edition, 1960, 10 × 7 in., pp. ix + 571, illus., 69s. 6d.

This up-to-date edition of a work first published in 1936 should be welcomed not only by American college students, but by British candidates for the advanced level in botany of the General Certificate of Education, or for university entrance. It will also prove extremely useful in the early stages of work for a botanical degree. The illustrations, particularly the line diagrams in the anatomical sections, are of a high standard and very clearly labelled. The text is well set out under headings, and the chapters on physiology, generally more advanced that the rest, should prove particularly valuable, as they summarize recent research which often takes far too long to penetrate into text books. The only suggestions that would appear justifiable for a future edition of this very excellent work are the inclusion of a chapter on the hydrophytes, xerophytes and halophytes, now relegated to a very brief paragraph, and a mention of minor elements other than S, Cl, Ca, Mg and Fe in plant nutrition. K.H.C.

3546. Lawalrée, A., and Sougnez, N.
Flore générale de Belgique. Spermatophytes. Vol. III—Fasc. III. **(A general flora of Belgium. Spermatophytes. Vol. III, Part III.)**
Minist. Agric., Jardin bot. État, Brux., 1960, 10 × 6½ in., pp. 400, illus.

This issue covers part of the Rosaceae, including *Alchemilla*, Mespilaceae and Amygdalaceae.

3547. Lee, W.
Fuchsias for greenhouse and garden.
Littlebury, Worcester, [1960], 9 × 6 in., pp. 47, illus., 9s. 6d.

If there must be another book on fuchsias this unassuming volume may well prove more welcome than some of its more pretentious forerunners. It is what reviewers like to call "a slim volume", only 47 pages and the price (for these days) is moderate. The print is clear and readable and lists of varieties are mercifully few. The book tells all that needs to be known for the successful cultivation of the fuchsia, a plant of singular docility, and the small space into which the information has had to be compressed has ensured that the fare provided is all meat, with a minimum of trimmings. There are some useful illustrations. It is a practical little book and can be recommended. G.St.C.F.

3548. Lhoste, J.
Les fongicides. **(Fungicides.)**
Office de la Recherche Scientifique et Technique Outre-Mer, 20 Rue Monsieur, Paris-VII^{e}, 1960, 10½ × 8 in., pp. 132, bibl. 11 pp., 8 NF.

The first part of this book deals in general with the history and properties of fungicides. Three sections are then devoted to mineral, organo-metallic and organic fungicides. Synergism and its effects are discussed, particularly that between copper and certain preparations dealt with in the previous section. Finally, two sections deal respectively with the antibiotics and fungal resistance to fungicides. For most of the very large number of fungicides described the author gives the formula, outlines their physical and chemical properties, including their toxicity to plants and animals, and indicates their principal uses. This book contains a vast quantity of useful information: it is unfortunately only cyclostyled.

3549. Paisley, K.
Fertilizers and manures.
Collingridge, London, 1960, 8½ × 5½ in., pp. 208, bibl. 9, illus., 30s.

Many growers and gardeners must hitherto have searched in vain for a book of this type, and the author and publishers are to be congratulated on fulfilling a long-standing need. The potential purchaser's first reaction may be that the price is rather high, but when he begins to skim through the pages he will find himself browsing extensively on the very sound, up-to-date subject matter that is both lucidly and interestingly presented, and will find that the coverage is not only wide, but thorough. He will then decide that he cannot afford to be without the book. In these days of over-specialization, it is heartening to find a soil scientist so interested in, and so conversant with, the physiological needs of many different types of plant, and not merely regarding "the plant" as an adjunct to soil chemistry. For convenience, the chapters may be grouped into: 2 on plants and their nutritional needs, 3 on the soil and its improvement by green manuring and by liming, 6 on fertilizers and composts, 1 on liquid feeding, and 1 each on the nutrition of vegetables, fruit crops, garden flowers and lawns, and glasshouse crops. Two appendices provide a dilution table and a list of fertilizers with their N, P_2O_5 (total and water-soluble) and K_2O percentages. The photographs and line diagrams are excellent. K.H.C.

3550. Popov, E. (Chief Editor), and others.
Bulgarian pomology. Volume I. Apples, pears and quinces. [Bulgarian.]
Zemizdat, State Publishers of Agricultural Literature, Sofia, 1958, 14 × 9½ in., pp. 424 + plates, illus., 99.20 leva [approx. 5 gns].

This large, handsomely produced book, the first of its kind to appear in Bulgaria, forms the first half of a survey of fruit varieties in that country and is the work of 14 authors, 5 editors and 2 artists. The love and aptitude of the Bulgarians for fruit growing, combined with the favourable conditions under which it is practised, may account for the large numbers of varieties described in the book, viz. 83 apples, 30 pears and 8 quinces.
A morphological description of the pome fruits and

a classification of apples and pears is followed by a general review of the 3 species. Aspects covered include their economic importance, the origin of the Bulgarian varieties, the areas suitable for specific types of culture, the history of their adaptation to local conditions, phenology, pollination characteristics, their resistance to cold, heat, drought and to pests and diseases, their chronological order of ripening and their quality and suitability for storage.

The bulk of the book, however, deals with the individual varieties, covering names and synonyms in 6 languages, origin, distribution, fruit characters including utilization and quality, tree characteristics and biology and, finally, their specific advantages and disadvantages. Excellent, life-size coloured illustrations are provided of the fruits and leaves of each variety from original paintings. Where these are not similar to the same varieties grown elsewhere, the variety, it is suggested, has undergone certain changes during its acclimatization in Bulgaria. The usual cross sections of the fruit are shown in both colour and line drawings, and an additional aid to identification is provided by photographs of whole trees during dormancy.

E.U.

3551. Roelofsen, P. A.
Encyclopedia of plant anatomy. Vol. 3. Part 4. The plant cell-wall.
Gebrüder Borntraeger, Berlin-Nikolassee, 1959, 10 × 7 in., pp. 336 + 68 plates, bibl. 14 pp., illus., DM.135.

This volume, translated from Dutch into English, forms part of the *Handbuch der Pflanzenanatomie* series. The first chapters deal with the occurrence, chemistry and other properties of the various cell wall constituents. The major part of the book, however, covers cell wall structure. Methods of investigation are first outlined, then the structure of the primary and secondary wall in the anthophytes is discussed and finally the cell walls in some algae and fungi are considered. Printing and production are excellent and the fine range of plates at the end of the book, which richly supplement the illustrations in the text, is noteworthy. There are indexes for subjects, scientific names and authors.

3552. Ruhland, W., and others (Editors).
Handbuch der Pflanzenphysiologie. Band XII. Pflanzenatmung einschliesslich Gärungen und Säurestoffwechsel. Teile 1 und 2. **(Encyclopedia of plant physiology. Vol. 12. Plant respiration including fermentations and acid metabolism. Parts 1 and 2).**
Springer-Verlag, Berlin, Göttingen and Heidelberg, 1960, 10 × 6½ in., pp. cclxxx + 1121, and pp. xix + 1421, bibls, illus., DM.598 (2 parts).

The subject matter is divided into sections as follows: (1) Introduction; (2) The chemistry of acid respiration and fermentation; (3) Analysis of the respiration processes; (4) Biology of respiration; (5) The acid metabolism of plants; (6) The carbon cycle. About half the sections or sub-sections are written in English. There is an extensive subject index in German and English. [For other volumes in this series, see *H.A.*, 30: 4602 and earlier.]

3553. Sinnott, E. W.
Plant morphogenesis.
McGraw-Hill Book Co., New York, Toronto and London, 1960, 9½ × 6½ in., pp. 550, bibl. 65 pp., illus., 97s.

This book is an attempt to co-ordinate the diverse aspects of botany which are concerned with growth and the development of form, and to synthesize them into a single discipline. Professor Sinnott has responded to the challenge of this considerable task and has produced a notable and useful book, which represents the distillation of forty years' accumulation of knowledge and experience in this field.

In his introduction the author, like other writers on this subject, suggests that, because of its comprehensive nature and its close relationship with other branches of botany, morphogenesis may well fulfil an integrating function. Certainly its scope can be gauged even from the list of contents of this book, which is divided into three sections. The first of these deals with growth in general, its cellular basis, and with apical and lateral meristems, including a brief survey of relevant experimental work. In part II the author considers the various phenomena of morphogenesis: correlation, polarity, symmetry (including phyllotaxis), differentiation, regeneration, grafts and chimaeras, and abnormal growth. Part III is concerned with a survey of the various factors operative in morphogenesis, including light, water, temperature, physical factors, general chemical factors, growth substances and genetic factors, and concludes with a short but important chapter on organization. The illustrations to the book are not always adequate, and the quality of their reproduction varies. Also more precise references to the original sources of figures would have been helpful. There is an extensive and useful bibliography and a good index, which is particularly useful since the arrangement of topics in the text is sometimes unexpected.

Professor Sinnott states that this book is designed primarily as a source of reference, and indeed it fulfils this function admirably for the subject as a whole, though the specialist in any one branch may have to look further afield. The presentation of so many facts within the compass of a single book is a considerable achievement, and no doubt their sheer volume has in some instances precluded a fuller discussion of their significance. Without this, however, the excitement of morphogenesis and its experimental investigation, and the challenging scope for new approaches and further study in this field, are not always conveyed to the reader. Yet there can be no doubt about the need for, and the value of, a single work dealing with all the aspects of this comprehensive subject.

The selection of topics, and the allocation of space to each, is no doubt a matter on which no two people would agree. Professor Sinnott considers that a book on morphogenesis is not an appropriate place to deal in any detail with tissue culture, but nevertheless the results of morphogenetic importance that have been obtained by this technique surely merit a fuller discussion that the 2½ pages allotted to them. A very welcome feature of the book, on the other hand, is the inclusion throughout of much information on morphogenesis in lower plants. It is useful to have these widely scattered data and experimental results, which may not be well known to some workers in the field, collected together.

The culmination of this book is its last chapter, which deals with the problem of biological organization, a recurring theme throughout the book. Professor Sinnott takes an early opportunity of warning his readers that the results of experiments with parts of the plant must not be interpreted as isolated events but as taking place against the background of the whole organism. The nature of this organized system is the fundamental problem of morphogenesis and, indeed, of biology. An understanding of the whole integrated protoplasmic system is required and it is difficult to isolate the effects of individual factors.

The author considers that every individual has a specific self-regulatory equilibrium, or morphogenetic norm, to which it tends to conform and to which it will restore itself if disturbed. This norm depends on the interaction between the genetic constitution of the individual and its environment, and on several "inherent protoplasmic traits": polarity differential gradients, symmetry and spirality. The action of genes and that of the environment in determining the form of an organism cannot be separated. In particular, it is not known how genes, or gene-controlled substances, control complex developmental relationships. The tendency of the organism to shift its course of development according to circumstances, attaining the same developmental goal in different ways, is especially difficult to explain, and some kind of regulatory mechanism must be involved.

Professor Sinnott states that "organic form results from the genetic and environmental modification of these three developmental tendencies, namely, polarity, spirality and symmetry". Yet the reader is left without a clear picture of the nature of these tendencies and of how they are inherent in the organism, for the author states that polarity, at least, is not irrevocably fixed by genetic factors. "Like any trait with a genetic basis, polarity is not a specific characteristic but a specific reaction to a specific environment." Spirality is considered to be a phenomenon fundamental to all organisms, and it is pointed out that symmetry is not confined to cellular structures. These tendencies must thus presumably have their basis in the physical characteristics of cytoplasm. They are evidently not controlled by chemical substances, since Professor Sinnot considers that these can only act as evocators and that the background on which they act is the important thing in morphogenesis. He states that the developmental tendencies are manifest in the patterned character of protoplasmic structure, and concludes that his suggested explanations of organic form involve physical rather than chemical factors, and that further information about morphogenetic problems should be sought in the field of biophysics.

With this book, and perhaps especially with his attempt at a statement of the problems of organization, Professor Sinnott has performed a notable service to biology. If the concepts which he discusses are not always immediately clear, that is largely due to the complexity of the subject and sometimes to the lack of adequate language with which to express them. Readers will no doubt differ in their views as to the extent that an attempt such as this can be of real use or value in the present state of knowledge. But Professor Sinnott's insistence on the importance and complexity of developmental relationships, and the difficulty of separating the factors involved in their control, is timely and stimulating. This book will provide a useful work of reference for both students and research workers and will stimulate thought about morphogenetic problems for some time. E.G.C.

3554. STAPP, C. [TRANSLATED BY SCHOENFELD, A.]
Bacterial plant pathogens.
Oxford University Press, London, 1961, 9½ × 6½ in., pp. xviii + 292, bibls, illus., 42s.

The appearance of Dr. Stapp's *Planzenpathogene Bakterien* in 1958 was enough to make most professionals and aspirants in this field of study count their blessings. This English translation is a totally unexpected recognition of the importance of the plant pathogenic bacteria and of the growing interest in these organisms.

Concerning the subject matter covered by the book there is little to add to the information given in the review of the German edition [*H.A.*, 29: 977]. Briefly the work is in two parts, the first dealing with techniques, and the second with 24 different pathogens selected as being of special interest in Central Europe. Under each pathogen are described its main distinguishing characteristics, the diseases it causes, modes of infection and spread, host range, resistant varieties, geographical distribution and the main control measures. Each account concludes with a fairly extensive and well chosen list of references.

This book is probably the best of its kind, but it does not quite measure up to the calibre of its author. This is a criticism of the scope rather than the content of the book. It was originally written for students in Europe and confines itself to European species of bacteria. The omission of tropical species, which include many of the most interesting pathogens, detracts from the value of the work, and what might have been a minor classic remains just an admirable text book. Nevertheless it is one of rare value and deserves to succeed. The English edition is as well produced as the original and that is high commendation. At 42s. it is a bargain and anyone calling himself a plant pathologist is urged to buy it. One final word to the publishers: the "blurb" on the front jacket gives the impression that bacterial diseases are of no consequence in the United Kingdom. This is not only misleading, it is rank bad publicity.

J.E.C.

3555. URQUHART, D. H.
Cocoa.
Longmans, Green and Co., London, New York, Toronto, etc., 2nd edition 1961, 9 × 6 in., pp. 293, bibls numerous, illus., 40s.

"Cocoa" was first published in 1955 [*H.A.*, 25: 2283], and it remains the only modern work which gives a comprehensive account of the crop. This second, revised and considerably enlarged edition is therefore particularly welcome, even at the increased price.

Since the first edition, there have been considerable advances in cultural practice and efforts to establish cacao in new areas. Moreover, in West Africa there is no longer the disproportionate attention to pests and diseases. These trends are reflected in the changes that have been made in the second edition. For example, there are new chapters which summarize recent developments in plant breeding, nutrition and propagation, including the recently introduced methods using polythene. The sections on climate, economics and marketing and the appendices also have been enlarged. The latter now range from a prescription for bordeaux mixture to the penalties for adulteration! A further useful addition would have been a clear explanation of the various codes now used for the numerous different cocoa types and selections. The separate chapter on virus diseases has been omitted, together with some of the more informative photographs including that of stem swellings. However, there is an account of the new, spectacularly successful methods of controlling capsids in West Africa and also references to cushion gall and *Ceratostomella* wilt which now cause such concern in South American countries.

The main achievement of the book is to summarize the observations and experiences of the author on his indefatigable travels throughout the tropics. This information will be of interest to the specialist research worker and invaluable to planters and agriculturalists, giving them the basic facts from which to develop their own cultural methods and attitudes to such old but still controversial issues as shade, spacing, the use of fertilizers and the relative merits of cuttings and seedlings.

J.M.T.

3556. WESTCOTT, C.
Plant disease handbook.
D. Van Nostrand Co., New York and London, 2nd edition, 1960, $9\frac{1}{2} \times 6$ in., pp. 825, bibl. 8 pp., illus., $13.50 or 101s. 6d.

This book is a reference compendium of a wide compass of information on diseases of plants grown in farms and gardens of the continental U.S.A., but excluding tropical diseases and those of field crops such as cotton and wheat. It is the outcome of a clearly successful marriage between sound training in plant pathology and the ranging experience of a general practitioner's career as "plant doctor". An acceptable touch of humour in a realistic approach to "do-it-yourself" advice evidently springs from the author's first-hand experience of clients in general, as well as of their field-pathology problems in particular.

The author has retained the general format of the first edition, published in 1950, as it was evidently satisfactory to the users. The text has been revised in the light of a decade of progress, more especially with regard to nematodes, virus diseases and the rapidly changing field of chemical control. Chapter 2 offers a brief, but up-to-date and, in most instances, sufficiently informative, review of available materials; one wonders how many of them would not receive short shrift in the average English garden!

The improved presentation of the classification of the pathogens and of virus diseases is distinctly helpful to the reader, though it is a moot point whether or not the classification is really at home or serves an essential purpose in a work of this kind. The two main chapters, viz. 4, Plant diseases and their pathogens, and 5, Host plants and their diseases, occupy more than three-quarters of the book. The arrangements are alphabetical. In chapter 4 the diseases are grouped into blights, cankers, downy mildews, etc., with a helpful, running page-headline, and the sequence of diseases is arranged under the genera initials of the latin names. In chapter 5 the hosts are treated individually, chiefly by common name, and their respective diseases are merely listed as a guide to descriptions in the previous chapter. Here a criticism of the 1st edition [*H.A.*, 21: 2134] might well be repeated—the scientific names of the causal organisms are too prominent throughout the book, if it really is intended primarily for gardeners. In fact, one reader suspects that the pathologist dominated the gardener in prompting the layout, though possibly the author tried the other way and found the confusion of common names too difficult to sort out satisfactorily.

The facts are briskly and readably presented, and the revised script and index carefully edited. The text is clearly arranged and excellently printed on good paper, and the book is attractive and well bound. Although a valuable reference work for libraries, its greatly increased price is likely to restrict individual purchases, at least in this country. M.H.M.

Annuals and reports.

(*See also* 1902, 1969, 2318, 2820, 2867, 2950, 2959, 3052, 3302, 3370-3373, 3391, 3496, 3497.)

3557. Agricultural Research Council.
Report of the Agricultural Research Council for the year 1958-59, H.M.S.O., London, 1960, pp. 213, bibls, 10s.

The work of the many institutes supported by the A.R.C. is reported, together with a number of special articles which include: Research and the apple industry, pp. 28–43, bibl. 5, and Controlled environment facilities for plant research, pp. 88–93, bibl. 11.

3558. Alberta.
Annual Report of the Department of Agriculture of the Province of Alberta for the year 1959, 1960, pp. 244.

Including notes on outstanding varieties of fruit, ornamentals and vegetables and on herbicide trials.

3559. Bermuda.
Annual Report of the Director of Agriculture for the year 1959, 1960, pp. 19.

Control of spittlebug (*Clastoptera undulata*) in casuarina was obtained with both malathion and dieldrin. Storage of waxed grapefruit at 60° F. proved superior to storage at 40° and 50° F.; dipping in Dowicide A-Hexamine definitely checked the development of fungal diseases in storage.

3560. Cameroons Development Corporation.
Annual Report of the Cameroons Development Corporation for the year 1959, 1960, pp. 29, illus.

Fertilizer trials on bananas, oil palms, rubber and cacao have shown benefits from the application of balanced NPK fertilizers. The disease of oil palms reported in the previous year has been identified as vascular wilt, and selection for resistance has begun. A disease of Tj.16 rubber trees has been confirmed as being due to *Oidium heveae.* A pepper root disease is under investigation.

3561. Canada.
Annual Report of the Department of Agriculture for the year ended March 31, 1960, 1960, pp. 51, 50 cts.

The Department has been reorganized so that a Research Branch integrates the work formerly carried on by the Experimental Farms Service and the Science Service. In contrast to the full report issued in previous years this report gives only a short general account of the research programmes, including work on top fruit, tomatoes, tobacco and crop protection.

3562. Canterbury Agricultural College, N.Z.
Annual Review for the year ending 30th June 1960, 1960, pp. 112, illus.

Horticultural research reported includes: Irradiation of tomato seedlings with high pressure mercury-vapour lamps from 12 midnight to 12 midday, for 3 weeks after pricking-out, resulted in larger, darker green and more robust plants than the control plants. Ring culture of tomatoes promoted more extensive root growth than planting directly in the soil but did not result in increased yield. With *Pittosporum* sp. wounding the cutting, by removing a slice of bark down to the cambium, plus an IBA dip increased rooting. Hardwood cuttings of several ornamental species rooted best in the orthodox peat/gravel medium, but *Micromyrtus ciliatus* showed a marked preference for an old sawdust/gravel mixture. The response of softwood cuttings of various species to mist propagation was studied, together with the problems of hardening-off and overwintering rooted cuttings, and with *Hamamelis mollis* and *Viburnum carlesii* it was found that new growth after transplanting was essential if the rooted cuttings were to survive the first winter.

3563. Ceylon.
Administration Report of the Director of Agriculture for 1959, 1960, pp. 207 [English pp. 111-207], Rs. 6.20.

Agricultural research, northern division: Myliddy 1, Myliddy 2, Tinnevely B 3 and Tinnevely B 16 chilli selections were highly resistant to the leaf curl complex and were much superior to the variety Turicorin in yield and resistance. The highest yields and optimum bulb size in Bombay onions were obtained with a spacing of 4 in. × 4 in. *Division of dry zone research:* Effective control of mango hopper was obtained with DDT 25% e.c. *Tobacco division:* Harrison's Special gave the highest yield of 7 cigarette tobacco varieties tested; the optimum N requirement was 10 lb./acre at within-row spacings of 2–2½ ft.; a topping level at 17 leaves was best; ethylene dibromide and Shell DD treatments were superior to heat sterilization in the seed-bed. *Division of horticulture:* Bibile Seedless sweet orange gave higher yields on "Heen Naran" and rough lemon rootstocks than on mandarin and sweet orange stocks; a lime-lemon hybrid made rapid growth, fruited early and gave a higher yield than Mindora, seedless lime, indigenous lime and British

Guiana lime; α-NAA induced early fruiting in pineapples. *Division of plant pathology:* Local and West Indian limes inoculated with the citrus virus by means of aphids became stunted by comparison with uninoculated plants and inoculated Tahiti limes and lemons. *Division of entomology:* DDT, 25% e.c. (1½ oz./gal.) gave effective and economical control of the cacao bark borer, *Indrabella quadrinotata*. Successful measures for the control of the coconut caterpillar, *Nephantis serinopa*, are outlined. *Division of up-country research:* Maximum flower induction in pineapples was obtained with α-NAA at 8 oz./100 gal.

3564. CHEMICAL SOCIETY.
Annual Reports on the Progress of Chemistry for 1959, 1960, Vol. **56**, pp. 476, bibls.

Included is a 13-page review entitled New amino-acids from plants, by L. Fowden and others.

3565. C.S.I.R.O., AUSTRALIA.
Eleventh and ***Twelfth Annual Reports of the Commonwealth Scientific and Industrial Research Organization for the years 1958-59*** and ***1959-60,*** Canberra, 1959, pp. 181, 10s. 6d., and [1960], pp. 129.

The first of these two reports resembles its predecessors in consisting mainly of notes on numerous lines of work. The second report, smaller in format and with larger print, contains only one relatively short section of notes on "Progress in research" (pp. 22–45), few of which concern horticultural crops. Hence most of the items mentioned below are taken from the earlier report. *Microbiology:* In the course of experiments on the phytoalexin theory one such substance, pisatin, has been extracted from peas and its structure elucidated. Results suggest that each plant produces its own phytoalexin. *Fruit investigations:* Spraying apple trees with growth substances has not led to greater cell division and fruit size. Earlier conversion of starch to sugars in Granny Smith and Jonathan fruits was effected by 0·5% borax sprays. Polythene box liners have increased the storage life of 4 varieties of pear. *Tobacco investigations:* Work is in progress on natural and induced mutations in *N. debneyi* and *N. goodspeedii* to produce blue mould-resistant strains. Structure and biochemistry of the leaves is being studied in relation to quality. *Merbein:* Spraying of currant vines with GA at 20 p.p.m. increased yields. *Eriophyes vitis* was killed after fumigation of dormant buds with either Vapam or Nemagon. A search for root-knot nematode-resistant mutants of tomatoes is in progress. *Griffith:* The nutrition of peaches, apricots and citrus is being studied. *Entomology:* The ecology of the Queensland fruit fly was studied and attempts to control it with Hawaiian wasps (*Opius* sp.) have met with some success. *Organic chemistry:* The composition of sugar cane wax has been shown to be principally polymerized long-chain aldehydes with lesser amounts of long-chain alcohols, which, under the present methods of extraction, suffer conversion to a mixture of substances, including ketones, acids and a little ester.

3566. DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.
Food Investigation 1957 and ***1958,*** H.M.S.O., London, 1958, pp. 81, bibls, 5s., and 1959, pp. 42, bibls, 3s.

1957: This publication includes reports from the Food Investigation Board, the Torry Research Station, the Low Temperature Research Station and the Ditton Laboratory. That from the Ditton Laboratory mentions the following experimental results: Storage of Cox's Orange Pippin apples in 6% CO_2 and 3% O_2 at 38° F. retarded the onset of *Gloeosporium* rotting. Pre-treatment of Bramley's Seedling apples in 20% CO_2 at 60° F. for 5 days reduced the amount of low-temperature injury developed during subsequent storage at 32° F. Plums stored with restricted ventilation and 15–17% CO_2 at 37° F. ripened more slowly and did not develop abnormal flavours, but after 20 days failed to ripen satisfactorily on removal from storage. Preliminary experiments indicated that carrots, beetroot and turnips are not damaged by, and may benefit from storage under, conditions of restricted ventilation, which allow the accumulation of up to 8% CO_2. Pre-cooling of watercress allowed 3–4 days storage without loss of quality. Bramley's Seedling apples developing CO_2 injury showed an increase in the succinic acid content of the tissue even before visible symptoms of damage appeared. "Feeding" apple peel discs with organic acids has given useful information on the organic acid metabolism of the tissue.

1958: At the Low Temperature Research Station biochemical studies on plant tissues and products included a separation of the leuco-anthocyanins from the cocoa bean. At the Ditton Laboratory studies on the effects of temperature, gas composition and cultural conditions on the storage life of apples and pears were continued, and pilot-scale experiments with controlled-atmosphere, cool storage of black currants and strawberries are reported. Storage of carrots, beets and swedes at 35° F. was improved slightly in an atmosphere of 6–7%, CO_2; leeks and brussels sprouts stored better with 16% CO_2. Unexplained seasonal differences were found in the total N content of Cox's Orange Pippin fruit from manurial trials at East Malling Research Station. The metabolism of organic acids in apples under different storage conditions was also studied; C^{14} labelling experiments showed that asparagine was apparently not in the main stream of acid metabolism. Ethanolamine was tested as an absorbent for CO_2 in gas stores, and the design of stores to maintain high humidity was studied.

3567. DIRECTIE VAN DE LANDBOUW, 's-GRAVENHAGE.
Tuinbouwkundig Onderzoek, Jaarverslag 1959. **(Horticultural Research, Annual Report 1959)**, Ministry of Agriculture, The Hague, pp. 365.

Reports are given of the many experiments in progress, which range from basic scientific research to demonstration trials. All the reports are regarded as provisional.

3568. DOMINICA.
Annual Report of the Department of Agriculture and Forestry 1958, 1960, pp. 25.

In a trial on the nutritional requirements of limes, which was started in 1956, N continued to produce the greatest growth increment followed by K and P in the ratio 1·7 : 1·5 : 1·03. Phosphate, however, gave the best results with bananas, the bunches reaped 3 months after treatment of 100 plants being 33 as against 23 for N and 19 for K. Vapam proved temporarily effective for the control of nutgrass and gave a good kill of broad-leaved weeds and grasses.

3569. EFFORD (N.A.A.S.).
Station Report of Efford Experimental Horticulture Station 1959, 1960, pp. 59.

This is the first of a series of reports which are to appear in this form, but this one, unlike future issues, contains information on 4 or 5 years' work. Information is presented in 3 ways, as final reports, giving the results of completed experiments, and as interim and progress reports, where results are not yet conclusive. It includes: *Fruit department:* Variety trials with apples, black currants, gooseberries, red currants, and strawberries; nutrition of apples, black currants, gooseberries (foliar application) and strawberries; pre-planting soil conditioners and herbicides for strawberries; controlling leaf-spot of black currants and American mildew on gooseberries. *Glasshouse department:* Controlled flowering of American spray and standard disbudded chrysanthemums; cucumber irrigation; trials of climbing French beans, lettuces and tomatoes; irrigation, conditioning of glasshouse soil, and temperature requirements of tomatoes; comparison of glasshouse heating systems. *Protected cropping department:* Variety trials with self-blanching celery, climbing French beans, lettuces, melons, strawberries, sweet corn and sweet peas; trials on spacing of self-blanching celery; propagation methods for early outdoor chrysanthemums; construction of cucumber beds; uncovering dates, propagation methods and plant spacing for lettuces and control of *Botrytis* stem rot; melon training; propagation methods, plant size, planting dates and spacing for strawberries; propagation, N nutrition and spacing of sweet peas; spacing of tomatoes in an unheated structure. *Vegetable department:* Variety trials with brassicas, onions and runner beans; herbicides for beets, broad beans, onions and peas; B/N nutrition of cauliflowers; bulky organics for leeks, carrots and broad beans; measurements of the long term residual effects of phosphate and potash fertilizers; irrigation of early summer cauliflower, early and summer lettuce, summer spinach and beetroot; insecticidal taints in carrots.

3570. FEDERATION OF RHODESIA AND NYASALAND.
Report of the Secretary to the Federal Ministry of Agriculture for the year ended 30th September, 1959, 1960, pp. 212, 10s. 6d.

The greater part of the report is concerned with the Department of Research and Specialist Services. *Plant pathology:* All samples of indigenous *Mucuna* were found susceptible to *Phytophthora dreschleri*, except *M. pruriens* from the Sabi Valley. When adjusted to a 0·1% Cu content, copper oxychloride and 2 : 6 : 50 bordeaux were less phytotoxic to apples than cuprous oxide and 2 : 3 : 50 bordeaux; the varieties Rhode Island Greening and White Winter Pearmain were the most susceptible to Cu injury. Bitter rot infection was reduced from 19·1 to 2·1% by 3 applications of 0·15% maneb at 3-week intervals followed by 4 of bordeaux at fortnightly intervals. *Agricultural chemistry:* Cases of Mg and Mo deficiency were diagnosed in citrus. A correlation was found between the degree of "slate" in slatey tobacco and the Al content of the leaf from plants on any one soil type, while the K/Mg ratio also tended to be low in the affected leaves. *Entomology:* Good control of bean stem maggot (*Agromyza phaseoli*) was obtained by a seed dressing of 0·2% of seed weight of endrin, dieldrin or aldrin. Seed dressing was not effective against cutworms but placing dieldrin around the bases of the plants in moist soils was successful. *Horticulture:* Details are given of acreages and yields of tree, vegetable and other crops.

3571. FIJI.
Annual Report of the Department of Agriculture for the year 1959, 1960, pp. 24, illus. 2s.

Research: Crop husbandry: Banana spacing at 11 × 6 ft. was found better than the normal 11 × 11 ft. where fertilizer was used, and increases of 3–6 cwt. per acre and 2–4 cwt. per acre were obtained from the use of urea and K_2SO_4, respectively. For control of scab moth (*Nacoleia octasema*) 2 sprays of 50% DDT w.p. on alternate days and dusting with 2% DDT each week were the most effective treatments. *Entomology:* Aerial spraying of coconut palms with 2¼ gal. dieseline containing 4½ oz. BHC per acre killed 95–100% of the stick insects (*Graeffea crouani*) infesting them.

3572. FRIESDORF. (MOHRING, H. K.)
XXXI. Tätigkeitsbericht 1959 der Gärtnerischen Versuchsanstalt zu Friesdorf/Bad Godesberg. **(31st Annual Report of the Horticultural Experiment Station at Friesdorf/Bad Godesberg for 1959)**, pp. 47, illus.

Variety trials were carried out with anthuriums, chrysanthemums and Lorraine begonias. There are also reports of studies on the reduction of labour costs (in particular for watering and shading) during summer culture of cyclamen, a rooting room for bulbs to be forced and a mobile glasshouse block. Observations on new horticultural equipment are also given; this includes paper and plastic pots, a soil heating cable, an irrigation hose, polythene to cover compost heaps, a leaf polish, a fertilizer pill for pot plants, a hoe, a rooting hormone and a soluble complete fertilizer. In the section on fruit growing there are reports on cropping (including biennial bearing) of several varieties as spindle bushes, the effect of dwarfing Malling interstocks on vigorous Malling stocks (yields in relation to spacing and the development of tree crowns).

3573. GLASSHOUSE CROPS RESEARCH INSTITUTE.
Annual Report of the Glasshouse Crops Research Institute, Littlehampton, for 1959,
1960, pp. 141, bibls, illus, 10s.

Plant breeding: All tomato plants resulting from crosses of Baby Lea and varieties with high quality fruit were of the green-stem/compact habit, and many produced a high percentage of fruit of optimum size, shape and colour. Small-fruited varieties matured quicker than larger-fruited varieties and the percentage of blotch was lower. *Plant physiology:* Work was continued on tomato growth in relation to time of year and on blotchy ripening. *Chemistry:* The application of phosphate increased yields of Potentate tomatoes, but liming depressed them. Little or no difference in vegetative growth was observed when 4 different concentrations of a nutrient solution ($K_2O/N = 1 \cdot 75$) were applied to Potentate tomatoes; a small decrease in yield was noted with increase in concentration, but the number of fruits of uniform colour and regular shape increased. Chlorosis due to Mg deficiency was lower at a K_2O/N ratio of 1 : 1 than at higher K_2O/N ratios. The total number of cut blooms of William Sim carnations increased by 21% with phosphate treatment. A general relationship appeared to exist between soil pH and the Mn content of lettuce and tomato tissue. The effects of nutrient concentration, manurial treatments and shading on fruit composition of different tomato varieties are reported. Mushroom yields were reduced by the addition of ½–2½ lb./sq. ft. of moist compost to the casing layer. Germination of antirrhinums and tomatoes in sand-peat mixtures was as good as, or superior to, that in J.I. compost. *Entomology:* Dimethyl phthalate was the most promising of the contact and vapour repellents tested against mushroom phorids. The reproduction of cecid larvae on mushrooms was improved by even a short feeding period on the weed fungus *Chaetonium*. *Mycology:* Experiments are reported on the spread of *Didymella* stem rot of tomatoes, cucumber mildew, carnation wilts and watery stipe and yellow mould of mushrooms. *Virology:* Indexing of carnation varieties, attempts to produce virus-free clones of carnations and chrysanthemums and the epidemiology of tomato mosaic are reported. Cucumber stunt mottle disease was found to be caused by a strain of arabis mosaic virus. Viruses of lupins, narcissi, primulas and celery were investigated. *Crop protection:* Traces of methyl isothiocyanate were very injurious to tomatoes, cucumbers and lettuces. Trials to determine the relative values of some newer systemic compounds for the control of the glasshouse red spider mite on carnations are reported. The report also contains a number of special research papers and reviews, which are abstracted separately.

3574. GROWER PUBLICATIONS LTD.
The Grower Annual 1961.
Crosby Lockwood and Son Ltd., London, 1960, 11 × 8½ in., pp. 149, illus., 25s.

Many of the articles which have been published in the weekly journal reappear, together with others written specially for the Annual. The scope is wide, and, although the subjects covered are primarily of concern to the commercial grower, there is much to interest everyone concerned with horticultural problems. The articles are grouped into 8 sections, and, besides the articles one would expect to find on newer techniques in growing vegetables, fruit and flowers, there are also some on finance, the law and insurance in so far as these affect the grower.

3575. HELLYER, A. G. L. (EDITOR).
Amateur Gardening Annual.
Amateur Gardening, Tavistock Street, London, W.C.2, 1960, pp. 121, illus.

Many of the articles in this annual are concerned with ways of improving the amateur's garden by introducing new or little known plants of value. However, the more scientific side is also represented by articles on irrigating vegetables, the soilless culture of carnations, heat therapy of chrysanthemums, adjusting plant environments and soil warming. Advice is given on machinery for the new garden, and—as a spur to the lazy—there is a weekly reminder of work awaiting attention in the garden.

3576. INSTITUUT VOOR BEWARING EN VERWERKING VAN TUINBOUWPRODUKTEN.
Annual Report 1958 of the Institute for the Storage and Processing of Horticultural Produce [in English], pp. 64, illus.

Reports on work in progress include the following: *Apples and pears:* Studies on methods for determining apple maturity; the measurement of apple fruit respiration; the accuracy of fruit graders; types of container for storage; the effect of transport, packing and grading on fruit quality; gas storage of 8 apple varieties; the influence of storage temperature on fruit quality; the use of plastic linings in storage boxes; keeping quality as affected by delayed cooling after harvest; studies on bitter-pit, Jonathan breakdown, Jonathan spot and scald; the economics of deterioration of apples and pears during storage; and cost factors in packing apples and pears. *Soft fruits:* A comparison of different commercial packages for soft fruit; mould development in strawberries as affected by clean and dirty containers; and gas storage of strawberries. *Grapes:* Keeping quality in relation to harvest time; gas storage and berry disinfection. *Vegetables:* Grading machinery for tomatoes; a packing trial for tomatoes; pre-packaging of carrots; keeping quality of onions; the influence of external factors on the keeping quality of celeriac and white cabbage; gas storage of cauliflowers; development of colour and firmness in tomatoes as influenced by picking time and after-ripening. *Ornamental plants:* Cold storage of rose bushes. In the second part of the report, which is concerned with processed products, there is information on the influence of insecticides and fumigants on flavour of strawberries and carrots, the influence of phosphate fertilizer on green bean varieties for canning; and drying mint and peppermint leaves.

3577. INSTITUUT VOOR BODEMVRUCHTBAARHEID, GRONINGEN.
Verslag over 1959. (**Report for 1959 of the Institute of Soil Fertility, Groningen.**) [English summary 4 pp.], pp. 38, illus.

The Institute co-operates closely in its research with the Vegetable Research Station at Alkmaar, Aalsmeer Floricultural Research Station and the Experiment Station of North Limburg at Venlo. Work reported includes: *Flowers:* Studies on carnation nutrition, soil media for cyclamen and azaleas, and iron chlorosis of roses. *Fruit crops:* Magnesium nutrition of Cox, leaching of N in a grass orchard, and observations on trees of Jonathan on M.XVI (mildew infection, canker occurrence, and critical values of K, Mg, Fe). *Vegetables:* N and P_2O_5 manuring of a spring lettuce crop, K requirements of grafted tomato plants, liming for improved asparagus growth, potting composts for lettuces and tomatoes and organic manures for several vegetable crops.

3578. INSTITUUT VOOR PLANTENZIEKTENKUNDIG ONDERZOEK, WAGENINGEN.
Jaarverslag 1959. (**Annual Report for 1959 of the Institute for Plant Pathological Research, Wageningen.**) [English summary $7\frac{1}{2}$ pp.], 1960, pp. 186, illus.

Some of the acarological, entomological and mycological studies on fruit crops have been reported in the Annual Report of the Fruit Experiment Station at Wilhelminadorp [q.v.]. Other research on horticultural crops is reported under the following headings: *Entomology: Strawberries:* Further confirmation was obtained that chemical control of *Pentatrichopus* reduced the spread of virus in the field; *Vegetables:* Parasitism of *Brevicoryne brassicae* on brussels sprouts was studied; *Chortophila brassicae* on sprouts was effectively controlled by 2 applications of 0·2% heptachlor 25%, but when *B. brassicae* was also present 0·25% diazinon 20% was more effective; *Napomyza lateralis* on chicory roots was controlled in trenches with 0·4% diazinon 20% or 0·4% parathion 25%, but field control was not effective; *Thrips tabaci* on onions was best controlled by insecticides with a long residual effect; one application of parathion was more effective for control of *Enarmonia nigricana* on peas than 2 applications of Phosdrin. *Mycology and bacteriology: Stone fruits:* Susceptibility to silver leaf (*Stereum purpureum*) was reduced by lowering the soil pH through Fe manuring. *Vegetables:* Foot rot of endive seems to be a soil-borne infection; corky root of tomato is caused by a sterile mycelium, the sclerotia of which were not killed at 100° C. for 10 min. *Flowers:* Work at Aalsmeer on controlling diseases of carnations, cyclamen and gerberas has been abstracted in *H.A.*, 31: 1059, 1113 and 1081, respectively. *Virology:* Rosette ("Eckelrade") disease has been shown to be soil-borne; meristem culture of heat-treated carnations is in progress, and attempts are also being made to grow delphinium meristems. Studies are being continued on virus symptoms appearing in strawberries, currants, raspberries, lettuces, chrysanthemums and cymbidiums. *Nematology:* Tobacco plants became infected with *Belladonna* virus when grown in infected soil, but the nematode vector is not known. Tridipam (N,N-dimethylthiuramdisulphide) at 30 g./sq. m. gave 93% mortality of *Hoplolaimus uniformis* and 83% mortality of *Pratylenchus penetrans;* comparable figures with Vapam at 50 ml./sq. m. were 98·8% and 97%. *Disease resistance:* Trials on varietal resistance to various diseases are in progress with beans, cucurbits and peas. *Agricultural aviation:* Aerial application of insecticides to beets and peas. *Biochemical research and the application of radioactive isotopes:* By harvesting healthy tobacco plants at different times the maximum levels of malic acid and citric acid were found to occur at

1 p.m., whereas the highest concentrations of oxalic acid and isocitric acid occurred at 4 p.m. *Air pollution:* Injury by fluorine and sulphur dioxide to tulips, other bulbs and vegetables has been further observed.

3579. Instituut voor Toegepast Biologisch Onderzoek in de Natuur.
ITBON—werkzaamheden in 1959. (**Activities in 1959 of the Institute for Applied Biological Research in Nature, Arnhem.**) [English summary 2½ pp.]
Meded. Inst. toegep. biol. Onderz. Nat. **48**. 1960, pp. 35, illus.

Studies on the effect of ploughing grassland on the earthworm population have shown a reduction from 100 to 10 earthworms per sq. m. after ploughing. In another plot the earthworm population was about 400/sq. m. under grass, but only about 30/sq. m. under a green manure. Short-cut grass was favourable for earthworm development. In orchards there were fewer soil populations of mites and springtails than in forest soils; numbers were greater in grassed orchard soils than in clean-cultivated orchard soils. In glasshouse soils sterilization by chloropicrin or by steaming reduced the earthworm population almost to nil; formalin was less drastic.

3580. Instituut voor Tuinbouwtechniek, Wageningen.
Jaarverslag 1959. (**Annual Report of the Institute of Horticultural Engineering, Wageningen, 1958**), 1960, pp. 68, illus.

The research section contains reports and results from studies on the following: a soil mulch of black plastic for strawberries [see abstract 2098]; covering strawberries in the open with plastic or aluminium paper for protection against night frost; extra lighting for seedling tomatoes; measurement of light and temperature in several types of cold glasshouse; the distribution of soil temperature in glasshouses heated by different methods; a light-sensitive thermostat; soil warming by electricity for glasshouse-grown tomatoes and frame-grown strawberries; soil sterilization by a steam plough; soil cultivation and soil improvement experiments on a peat soil; soil compaction in wheel tracks; mulching of orchard soils with plastics; soil management for apples and pears; grass cutting trials (number of times per season and height of cut); cultivation with two types of machine hoe; studies of low volume spraying; the use of bulk bins in fruit harvesting; mushroom picking; the estimation of heat consumption in horticultural holdings; modern glasshouses for an early tomato crop; and the financial aspect and choice of glasshouses.

3581. Iowa.
Annual Report 1959-1960 of the Iowa Agricultural and Home Economics Experiment Station and the Cooperative Extension Service in Agriculture and Home Economics, [1960], pp. 11.

Mainly a list of publications.

3582. I.R.S.I.A.
Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture. Rapport annuel. Exercice 1959. (**Annual Report of the Institute for the Encouragement of Scientific Research in Industry and Agriculture, 1959**), Brussels, 1960, pp. 237.

The report includes brief summaries of the following research programmes: Isotopes in agricultural research; fruit diseases and pests and their control; plant growth substances and photoperiodism; controlled environment for fruit growing research; disease and pest control in ornamental plants; plant physiology, including some non-parasitic diseases of apples, reactions of fruit trees to fungicides and photosynthesis; the physics of sprays and problems of residues; strawberry growing and selection; weed control; hop growing and selection; breeding, salt tolerance and disease control in vines.

3583. Jamaica.
Annual Report of the Ministry of Agriculture and Lands for the year ended 31st December, 1958, 1960, pp. 92, 4s.

Agricultural research services. Crop agronomy division: Breeding and selection continued on bananas, cacao, coffee and citrus. Trial plots of Virginia tobacco were laid down in 5 localities. *Plant protection division:* Dieldrex proved to be the best soil insecticide for the control of fiddler beetle on citrus roots, remaining effective for 4 years after application.

3584. Jersey.
Annual Report of the States' Experimental Station, Howard Davis Farm, Trinity, for 1959, 1960, pp. 120.

Pre-emergence application of neat tractor vaporizing oil or 10% sulphuric acid gave excellent initial weed control in anemones without plant damage. Plants from larger anemone corms planted in July flowered earlier than those from smaller corms, but a uniform increase in plant size from all grades of corms was noted by September and the size and quality of all their blooms was equal by November. Pre-heating of gladiolus corms advanced flowering by 7–10 days. Tomato plants grown in soil sterilized with formaldehyde, chloropicrin or sistan required feeding much earlier than those grown in steam-sterilized soil. *Mycological department:* Control of *Didymella* stem rot in tomatoes was 4 times more effective with captan (50% active ingredient at 2 lb./acre) or maneb

(70% at 2 lb./acre) than with a copper spray (50% at 3 lb./acre). Control of eelworm in narcissus bulbs was obtained by treating them for 3 hours in water at 110° F. DD mixture (540 lb./acre) gave effective but short-lived control of eelworm in tomatoes when these followed early potatoes or tomatoes.

3585. MAX-PLANCK-GESELLSCHAFT. Tätigkeitsbericht der Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. für die Zeit vom 1.4.1958 bis 31.3.1960. **(Report on the activities of the Max-Planck Institutes for the Advancement of Science from 1.4.58 to 31.3.60.)** *Naturwissenschaften*, 1960, **47**: 553-99.

The following are among the projects reported; *Max-Planck-Institut für Biologie (Tübingen):* The induction of mutations of TMV with HNO_2 and the nature of these mutations. *M.-P.-I. für Biophysik (Frankfurt):* The effect of ionizing radiations on morphogenesis in *Eranthis* and *Arabidopsis* and on germination in *Digitalis*. *M.-P.-I. für Zellphysiologie (Berlin):* The chemistry and dynamics of photosynthesis. *M.P.I., für Züchtungforschung (Hamburg):* Breeding of *Phaseolus* and the induction of mutations in apple with γ-rays, the latter having yielded mutations of commercial value.

3586. MINISTERIE VAN LANDBOUW, THE HAGUE. *Tuinbouwgids 1961.* **(Horticultural guide for the Netherlands, 1961)**, The Hague, Netherlands, 1960, 9 × 6 in., pp. 697, illus, fl. 8.50.

A good deal of the subject matter follows the customary formula, presenting a considerable amount of valuable information for growers and advisory officers. Among the cultural articles in the various sections the following are included: *Vegetables:* Lettuce growing in the winter; choice of variety and raising seedlings of cucumbers; raising cauliflower seedlings. *Fruit:* Varietal descriptions of apples, pears, plums and cherries; pruning; concentrate spraying; cold storage of apples, pears and grapes. *Bulbs:* Machines for lifting and for planting bulbs; *Fusarium* diseases of bulbs; mechanical injury to bulbs; storage temperatures for young bulbs. *Perennial plants:* Recommended horticultural varieties of various herbaceous species; species of *Cimicifuga* grown in the Netherlands; varieties of Michaelmas daisy recommended and not recommended. *Shrubs:* Rose varieties for parks; taking summer cuttings under single glass; the storage of packaged plants in a cold store. *Flowers:* Growing all-year-round chrysanthemums; glasshouse rose varieties; mist propagation of carnations; the use of mobile glasshouses. *Seeds:* New developments in cucumber breeding; breeding of beans and green peas; the use of permanent isolation cages in selection work; N manuring of horticultural seed crops; seeds as a source of infection in the crop.

3587. MINISTRY OF AGRICULTURE, LONDON. ***Agricultural Statistics 1957/1958, England and Wales,*** H.M.S.O., London, 1959, pp. 167, 8s. 6d.

Acreages, production figures, prices and index numbers.

3588. NAALDWIJK. (VAN SOEST W., AND OTHERS). *Jaarverslag 1959, Proefstation voor de Groenten en Fruitteelt onder Glas te Naaldwijk.* **(Annual Report of the Research Station for Vegetable and Fruit Growing under Glass, Naaldwijk, for 1959)**, pp. 162, illus. [English summaries 10 pp.].

Short English summaries are provided for the following general articles: The uptake of inorganic nutrients by tomatoes from the soil. Variation in fertilizer distribution in the soil. Sub-drainage of sandy soils. Fertilizing by a sprinkler-system. Carbon dioxide determination in cucumber houses. The effect of glasshouse type on glasshouse climate. Methods of grafting tomatoes. Growing early sweet peppers under glass. Lettuce growing on disinfected soils. The influence of soil temperature on the flowering of corm-freesias. The uptake of labelled P by young tomato plants. Pollination and fertilization of glasshouse plums. Tomato breeding. Non-bitter cucumber varieties and hybrids. Green-back and yellow-head in tomatoes. Bull-necked cucumbers. Leaf spot diseases of cucumber. Freesia "fire". Chemical control of weeds in *Scorzonera hispanica*. Scorch of chrysanthemums by plant protective materials. The research reports cover the following subjects: *Soil, water and manuring:* Organic materials for tomatoes, lettuces and cucumbers; irrigation of cucumbers; soil factors promoting earliness in lettuce; sulphur treatment of calcareous soil; fertilizers for tomatoes, lettuces, cauliflowers and cucumbers; and trickle irrigation for tomatoes, cucumbers and carnations. *Soilless culture:* Of tomatoes and cucumbers. *Cultural trials:* Tomatoes (grafting, removal of side-shoots, growing with 2 or 3 stems); cucumbers and melons (grafting, pinching); egg-plants and capsicums (grafting); lettuces (forcing temperature, mulching); chicory (time of lifting the roots); fruits (growing Muscat of Alexandria, rootstocks for Black Alicante vines, growing peaches); flowers (storage temperatures for nerines and freesias, breaking dormancy of freesias, soil temperatures for freesias, forcing irises, winter-flowering snapdragons, controlling flowering of *Tritonia crocata*). *Physiological studies:* Root development of tomatoes, lettuces and scorzonera; uptake of labelled P by young tomato plants; phytotoxic effects of glycerine on tomato plants; spraying tomatoes and cucumbers with sugar, manganese or urea; artificial illumination for tomatoes, melons and lettuces; growth substances to improve tomato and cucumber fruit set; storage of *Lycopersicon* pollen; germination of tomato pollen; gametocides to kill pollen of tomatoes and cucumbers; different methods of melon pollination; maleic hydrazide against sponginess in radishes; pollination and fertilization of glasshouse plums. *Breeding and variety trials:* With tomatoes, cucumbers, melons, eggplants, capsicums, lettuces, spinach and chicory; strawberries and grapes; freesias and stocks. *Storage and packing:* Of tomatoes, peaches, cauliflowers and grapes. *Diseases, pests and weeds:* Studies on physiological, virus, bacterial and fungal diseases of glasshouse vegetables and freesias and their control.

3589. NATIONAL AGRICULTURAL ADVISORY SERVICE. ***N.A.A.S. Regional Experiments in Horticulture,*** 1960, pp. 83.

A summary of experiments in progress from October, 1959, to September, 1960.

3590. NEW SOUTH WALES. ***Report of the Department of Agriculture, New South Wales, for the year ended 30th June, 1959,*** 1959, pp. 144, illus., 11s.

This report outlines the many research projects in each Division. These include: *Plant industry:* Breeding early *Fusarium* wilt-resistant tomatoes; breeding garden peas and cucurbits; cauliflower fertilizer trials; use of black plastic film mulches; weed control in strawberries and gladioli. *Horticulture:* Desuckering trials with bananas; avocado seed treatments for root-rot control; control of *Cercospora* leaf spot of bananas by low volume misting; storage of apples and pears; soil fumigants and the replanting of prunes; control of wastage in citrus fruits; methods of improving the rooting of *Phylloxera*-resistant vine cuttings; increasing yields of dried Zante currants with GA; irrigation of wine grapes. *Science services:* Fungal, bacterial and virus diseases of tomatoes; control of the stem, leaf and pod disease of peas (*Mycosphaerella pinodes*); varietal resistance of cucumbers to downy mildew; control of apple scab with single sprays of 0·1% phenyl mercury chloride; peach and prune replanting problems; diseases of tropical fruits, grapevines and ornamentals; Mn toxicity symptoms in apples.

3591. NEW ZEALAND, DEPARTMENT OF AGRICULTURE. ***Reports of the Department of Agriculture for the years ended 31 March, 1959,*** and ***31 March, 1960,*** 1959, pp. 174, and 1960, pp. 197.

1959: Extension division: Progress on the elimination of water hyacinth and Cape tulip; control of weeds in brassica crops using monoxone (15 lb./acre); satisfactory crops of tomatoes, lettuces and canning peas were obtained on peat soil, but Mg and N deficiencies were evident; swede varieties Calder, Sensation, Wye and Doon Spartan showed marked aphid resistance. *Horticulture division:* Fruit rot associated with pink eye, a new disease, destroyed up to 15% of the crop of Williams' pears in severely affected orchards; spraying Laxton's Superb apples with α-NAA (15 and 20 p.p.m.) in the on-year effectively thinned the trees and resulted in a moderate crop the following off-year; sprays of lime-sulphur (1 : 30) and Sulfane (2 lb.) followed by Karathane (1 lb.) gave better control of powdery mildew on Jonathan apple trees than the standard sulphur programme; post-harvest sprays of PMC (Ascospray) at 5 lb./100 gal. on Delicious trees significantly reduced black spot [scab] infection; mealybug on Williams' pear trees was controlled by 1 spray of diazinon, 1 pt./100 gal; DPA (diphenylamine) controlled scald in Granny Smith apples; pre-blossom sprays of DDT reduced capsid bug damage on peaches; raspberry aphis was controlled by tar distillate sprays; control of mealybugs, resistant to DDT, has been obtained in vineyards using parathion, malathion, diazinon and DDT at higher concentrations than were previously used; Muscat Ottonel, a promising new grape variety, is described; breeding tobacco for resistance to black root rot and mosaic is making good progress; captan and maneb sprays are being used to check the spread of *Didymella lycopersici* on glasshouse and outdoor tomatoes; tomato V-548 showed resistance to leaf mould infection; acidulated mercuric chloride gave the best control of club root in brassicas; Dithane was most effective in controlling celery leaf spot; variety trials of strawberries, black currants, vegetables, grapes and ornamentals are reported; in a comparison of 5 fertilizers for use in trickle irrigation of tomatoes the highest yields were obtained with a solution of sulphate of ammonia and potassium nitrate; partial weed control under vine trellises was obtained with 2–3 treatments of Weedicide (40 gal./acre.); dalapon (30 lb./acre) completely suppressed couch grass in the vineyard for 1 season but regeneration occurred the following season, and mature vines appeared weakened. *1960: Horticulture division:* Perennial ryegrass and white clover has proved a suitable mixture for grassing down orchards, and with regular mowing these can be managed without irrigation; Metasystox gave good control of all spider mite species, except in 3 instances where mites were resistant; diazinon at 1 pt./100 gal. was effective in controlling apple leaf curling midge on M.IX stocks; Sulfane at 2 lb./100 gal. was more effective than Karathane at 1 lb./100 gal. in controlling apple powdery mildew; bitter pit was most severe in the earlier picked apples and in the larger fruit; 4-year trials showed that diphenylamine controlled scald completely during apple storage; spraying cherries with 2,4,5-T within 48 hours of a frost during blossom time kept some of the fruit on the tree; mercuric chloride gave better control of club root in brassicas than calomel, PCNB, griseofulvin, zineb and maneb; lettuce raised from mosaic-free tested seed produced more first-grade heads.

Levin Horticultural Research Station: Black polythene mulches encouraged vigorous growth and much earlier fruiting of strawberries; raspberries in a mown sward produced a lower yield one year and a higher yield the next than cultivated canes. *Te Kauwhata Horticultural Station:* Cuprox gave better protection than maneb and zineb against downy and powdery mildews of vines; maneb was outstanding against black spot (*Elsinoe ampelina*) infection of grape bunches, but was not so effective on the interior canes and laterals.

3592. NEW ZEALAND, D.S.I.R.

Report of the Department of Scientific and Industrial Research for the year ended 31 March, 1960, Wellington, 1960, pp. 128, 4s. 6d.

Among research items mentioned are the following: The new *Phytophthora*-resistant hop varieties First Choice and Calycross, early and mid-season, respectively, are being released to growers; varietal resistance to pea leaf roll virus has been established; infection of orchards with *Parlatoria* scale has been reduced by controlling the infestation in neighbouring *Pinus radiata* shelter belts; with the new vigorous apple rootstocks being tested a system of pruning involving 3–5 vigorous upright leaders, tied to a hoop of wire near the top, with a series of horizontal branches carrying many lightly-pruned fruiting laterals shows promise; chemical blossom thinning of the Statesman apple variety for 8 years prevented biennial bearing and produced a total crop 20% greater than that of untreated trees; Golden Delicious, Granny Smith and Sturmer apples stored well in gas stores in mid-December with no sign of breakdown; the application of chloropicrin successfully controlled *Verticillium* in tobacco fields, and a tractor-mounted applicator gave very satisfactory results.

3593. NIGERIA, FEDERATION.

Annual Report on the Department of Agricultural Research, 1958-59, Lagos, 1960, pp. 43, 9d.

Kola: Hybrids grown from white nuts produced by crossing 2 white nut parents were the lowest yielding, and hybrids from red nuts, produced by crossing pink and red nut trees, were the highest yielding. The mechanism of inheritance of cotyledon colour was studied in *Cola nitida*. *Coffee:* Gold Coast robusta produced the highest yield, giving 4,500 lb. of fresh cherry per acre. *Chemical control:* Trials for the control of the coffee berry borer showed that treatments with dieldrin and endrin were significantly better than the controls. *Cashew:* Severe damage to the young shoots by *Helopeltis sanguineus* was observed.

3594. NORTH CAROLINA.

Annual Report of the School of Agriculture, North Carolina State College for 1959, pp. 33, illus.

Research programmes and developments outlined include mention of a new disease-resistant tobacco variety, NC75, and other tobacco investigations; also a new early peach variety, Marcus.

3595. ONTARIO.

84th Annual Report of the Ontario Agricultural College and Experimental Farm, 1959, 1960, pp. 107.

Research results mentioned include the following: Naphthaleneacetamide was most effective as a blossom thinning agent on apples when applied at petal fall at 75 p.p.m. A temperature of 34° F. for 5 weeks broke dormancy of Pocahontas strawberry plants, but a GA spray at 100 p.p.m. only caused elongation of peduncles and petioles and did not break the rest period. Scarified raspberry seeds soaked for 72 hours in either 100 p.p.m. GA solution or water containing Tween 20 germinated as well as seed stratified for 1 month at 34° F. Exposure of water-imbibed tomato seeds to alternating high and low temperatures tended to increase flower numbers per cluster. The storage temperature of gladiolus corms did not affect emergence date, blooming date or weight of corms produced, but storage at 35° F. to 45° F. improved inflorescence quality significantly. A growth reduction factor was found in chrysanthemum roots and its dwarfing effects were mitigated by steam and methyl bromide soil treatments.

3596. REPUBLIC OF IRELAND.

28th Annual Report of the Minister for Agriculture, 1958-59, Dublin, 1960, pp. 167 + 85, 8s. 6d.

Peatland Investigation Centres: At Derrybrennan black currants have been growing well on cut-over peat. *Peatland Experimental Station:* Satisfactory yields of carrots, parsnips and peas were obtained; brassicas also grew successfully, but there were some minor element problems. Trials with bamboo and New Zealand flax were successful. *University College, Dublin:* During a season of severe apple scab incidence observations were made on varietal reaction. Ring culture of glasshouse tomatoes on a clinker-ash base in polythene lined trenches gave pickings about a week ahead of ordinary soil culture, but total yields were no greater. Supplementary illumination of potted tomato plants followed by planting in heated soil resulted in the highest total yields, whereas the highest early yields were produced by non-illuminated plants grown in heated soil.

3597. ROSEWARNE.

Fifth Report of Rosewarne Experimental Horticulture Station and Ellbridge Substation, 1959, Camborne, 1960, pp. 102.

Work on anemones, bulbs, winter cauliflower and spring cabbage has been abstracted separately. In addition there is a report on the maintenance of N.I.A.B. stock seed of Roscoff winter cauliflower. The other reports given concern: *Other vegetables:*

Variety trials with red beet in the open and with tomatoes in a mobile glasshouse; manuring of leeks, broad beans and runner beans; time of sowing broad beans. *Fruit:* Variety trials with strawberries, black currants, apples and rhubarb; time of N application to strawberries; frames or cloches for strawberries. *Other flowers:* Manurial trials with violets and polyanthus; weed control in plots of *Chrysanthemum maximum*, asters, *Erigeron*, polyanthus and violets; variety collections of wallflowers, violets, polyanthus, *Chrysanthemum maximum* and sweet william; propagation methods for chrysanthemums. *Mobile glasshouses:* The rotations used are described; with freesias observations were made on the effects of time of sowing and on seed-bed covers. *Ellbridge Sub-station:* Strawberry varieties, control of botrytis, cold storage of runners, spacing and weed control; variety trials with beans (*Phaseolus*), spring cabbage and early cauliflower; methods of propagation for early lettuce; variety collections of chrysanthemums and narcissi; weed control in asters; control of narcissus bulb fly; control of iris leaf disease (*Didymella macrospora*); manuring and control of downy mildew of anemones; protection for strawberries and anemones and other flower crops.

3598. SARAWAK.

Annual Report of the Department of Agriculture for the year 1959, 1960, pp. 93, illus., $2.

Research and investigation: Varietal and fertilizer trials on pepper continued. The application of Perenox appeared to reduce the spread of foot rot (*Phytophthora* sp.). At the Tarat agricultural station experiments and observations were made on coffee, bananas, citrus, rambutans, durians and papaws.

3599. SCOTTISH HORTICULTURAL RESEARCH INSTITUTE.

Seventh Annual Report, 1959-1960, 1960, pp. 72, illus.

Pomology: Preliminary graft tests indicated that immunity to 3 soil-borne raspberry viruses is a dominant character, probably simply inherited; tetraploid plants of Malling Promise, Malling Exploit and the East Malling seedling 69/139 were of lower fertility than diploids; 3 raspberry varieties showed striking responses to increased levels of sulphate of ammonia; effects of soil management on cropping of raspberries are noted; simazine (2·5 lb./acre) and monuron (3·5 lb./acre) applied to raspberries in April gave good weed control throughout the summer and the following winter even after 2 rotary cultivations and without harm to the canes; simazine, at 1·5 and 3 lb./acre in mid-March, also gave good weed control in Talisman strawberries, with only slight foliar damage at the higher rate and no adverse effect on yields; 7-year-old apple trees were unharmed by 5 lb./acre dalapon applied in mid-June on grass around the base of the trees; early mowing (defoliation) of strawberries increased cropping the following year, whereas N applications after mowing generally depressed yields. *Vegetable crops:* Variety trials with French beans, broad beans, brussels sprouts, cabbages, broccoli, calabresse, carrots, beetroot, leeks, winter lettuces and ridge cucumbers are described; autumn-sown plants of 5 varieties of brussels sprouts gave larger yields of paler coloured sprouts than spring-sown plants; breeding experiments with brussels sprouts, cabbages and dwarf beans are reported.

3600. SCOTTISH PLANT BREEDING STATION.

Report 1960, pp. 105, illus.

Briefly mentioned in the Director's report are interspecific crosses between *Brassica* spp. The report includes a paper entitled "Internal breeding barriers in *Papaver*," by I. H. McNaughton, pp. 76–84.

3601. SIERRA LEONE.

Report of the Department of Agriculture for the year 1958, 1960, pp. 39, 4s.

Of 5 treatments tried for the control of cacao black pod (*Phytophthora palmivora*) 4 involving fungicides were effective, but of these 1·0% carbide bordeaux was superior to both 0·4% Perepod and 0·4% Kopapod. Cacao virus disease studies are also reported.

3602. SOUTH AUSTRALIA.

Report of the Minister of Agriculture for the year ended 30th June, 1959, 1960, pp. 66.

The projects under investigation at the 11 research centres are summarized. Work done by the horticultural research officers includes the following items: the control of thrips by DDT spray reduced fruit drop in Washington Navel oranges and gave a 20% increase in crop; by using 2 sprays of 0·1% DDT mealybug was controlled on oranges to satisfy export requirements; fruit storage trials with polythene case liners for apples and pears yielded good results; commercial control of superficial scald was obtained in Granny Smith apples with DPA wraps and dips; SOPP wash/wax treatment and diphenyl wraps both reduced centre rot in stored citrus, the latter giving better control of storage spot in Washington Navels; Ohanez grapes kept for 5 months in a cool store at 32° F. with regular sulphur dioxide, Gordos also kept for 4 to 5 months and Malagas for 4 months, but these last two were less satisfactory varieties for storage.

3603. SURINAM.

L.V.V. in 1958. Overzicht van de verrichtingen van het Departement van Landbouw, Veeteelt en Visserij in 1958. **(A survey of the work of the Department of Agriculture, Stock and Fisheries in 1958.)**

Surinaam. Landb., 1960, **8**: 25-93 + tables, illus.

Brief reports are included on citrus manuring, spacing, rootstocks and rust mite control; cacao manuring, *Phytophthora* control and clonal trials; and coffee selection.

3604. TANGANYIKA AGRICULTURAL CORPORATION. ***Report and Accounts for 1958-59,*** 1960, pp. 99, illus., 12s.

At the Beta Trial Farm very variable yields were obtained from Hungarian dwarf castor beans. At Rujewa in a dwarf bean variety trial Genfer Market gave the highest yield of seeds; for Canadian Wonder the best planting date was 1 August, but for Idaho Refugee 18 August; Michigan was the most successful variety of pea bean and 18–31 August the best period for planting.

3605. WASHINGTON. ***Sixty-ninth Annual Report of the Washington Agricultural Experiment Stations for 1958-1959,*** 1959, pp. 56, being *Bull.* **615**.

Current projects, publications and staff listed.

3606. WASHINGTON STATE COLLEGE. ***Washington Research Progress in Agriculture, and Home Economics. Report No. 2. Agricultural Engineering,*** May 1960, pp. 2.

In air-supported plastic greenhouses an air pressure of 1·5 lb./sq. ft. supported a 6-mil. polythene cover under most weather conditions. A temperature of 55° F. or more was necessary, so that snow would melt quickly and slide off the plastic. Costs of construction are given.

3607. WASHINGTON STATE COLLEGE. ***Washington Research Progress in Agriculture and Home Economics. Report No. 3. Agronomy,*** May 1960, pp. 15.

Neither N nor P fertilizer influenced the maturity of peas, but K and possibly Mg hastened it; commercial fertilizer should be applied to forced rhubarb in a band on both sides of the crowns at a depth of 4–6 in.; rates of 50 lb./acre of N produced the highest yields of cucumbers and pole beans; high rates of N depressed yields in vegetables, particularly cucumbers; iron DPTA (Chelate 330) sprayed on fruit tree leaves reduced chlorosis by about 60%; simazine controlled annual weeds in cabbage transplants; calcium cyanamide showed promise for weed control in spinach; a pre-planting application of CDEC controlled weeds in broccoli, cauliflower and lettuce; annual weed control in strawberries was obtained using simazine (2 lb./acre); weed control in blueberries was obtained by using a combination of simazine and amitrol; diuron gave season-long weed control in ornamental bulbs.

3608. WASHINGTON STATE COLLEGE. ***Washington Research Progress in Agriculture and Home Economics. Report No. 6. Entomology,*** May 1960, pp. 6.

Effective control of symphylids in mint was obtained by treatments with V-C 13 (10 lb./acre) and E.N.18133 (5 lb./acre), both of which increased the yield 4 times compared with that of untreated plots; Kelthane gave effective mite control on mint and malathion controlled aphids; honey bees initially collected nectar from peppermint, when this crop was growing next door to fields of clover and corn; excellent control of tipworm larvae on huckleberry was obtained with a spray of Rhothane in April; diazinon applied at seeding time with a supplemental dusting in August or September controlled a strain of carrot rust fly resistant to chemicals previously used; furrow applications of diazinon, Trithion, ethion, Guthion or V.C.13 (2 lb./acre) at planting time controlled resistant strains of onion maggots; Sevin and endrin gave best control of cabbage seedpod weevil; endrin and Systox gave good control of shallot aphids on strawberries; autumn sprays of endrin and Thiodan gave the best control of the strawberry aphid, and May sprays (1 qt./acre) gave the best control of cyclamen mites; wood weevil in strawberries was controlled by benzene hexachloride at 2, 4 and 8 lb. gamma isomer/acre; metaldehyde sprays and dusts gave good control of slugs in strawberries; control of the raspberry crown borer was obtained with parathion, and Kelthane gave the best control of the dry berry mite on loganberries; control of codling moths and aphids on apples was obtained with dimethoate, and oil or oil-phosphate sprays at the pre-pink stage controlled resistant European red mites and apple rust mites; pre-bloom applications of Sevin and Dilan controlled pear psylla, as did summer sprays of Guthion, Dilan and methyl Trithion; post-harvest applications of diazinon, lime-sulphur or Volck Supreme oil were effective against pear leaf blister mite; a summer spray of Tedion was effective against all pear mites; satisfactory control of green peach aphids was obtained with nicotine + oil or soap, Phosdrin or Thiodan; twig borer larvae were controlled by *Bacillus thuringiniensis;* twig borer and pandemis moth on apricot were controlled by Sevin, Guthion and DDT + parathion; Kelthane and Tedion controlled 2-spotted mites; the best control of stone fruit mites was obtained with Kelthane when it was applied with a speed sprayer; apple pollen containing dieldrin was poisonous to bees only when dieldrin was applied during the bloom period.

3609. WASHINGTON STATE COLLEGE. ***Washington Research Progress in Agriculture and Home Economics. Report No. 7. Forestry,*** May 1960, pp. 2.

A heavy mulch of sawdust around Christmas trees, combined with larger planting stocks, resulted in excellent survival and control of competitive vegetation.

3610. WASHINGTON STATE COLLEGE. ***Washington Research Progress in Agriculture and Home Economics. Report No. 9. Horticulture,*** May, 1960, pp. 12.

Harvesting and handling apples and pears in bulk bins instead of boxes reduced costs by 5–6 cents/box; dwarf trees were 15% faster to pick than standard trees; Standard Delicious stored well at 30–31° F., R.H. 95%, CO_2 at 1% or less, and O_2 at 2½–3%; low rates of weed-killers should be used round fruit trees to avoid damage, and the trees should not be mulched; production per acre increased when filler trees were left in with the sides cut back; Delicious apples first became fully mature after 142 days or 2,700 degree days; Earliril apricot showed excellent frost hardiness; to ensure maximum germination of cherry seeds 2 or more months of after-ripening, mechanical scarification and a 24-hour soak in gibberellin solution (40 p.p.m.) is recommended; 2,4,5-TP increased yields of Early Italian prunes by 50%, cold hardiness of peaches was increased by N; evaluation of new tree-fruit varieties is reported; softening of brined cherries was due to pectinase enzymes produced by micro-organisms on the fruit; further studies on the causes and control of pear decline are reported; clean cultivation in Concord grapes resulted in outstanding production and quality compared with cover crops; grapes trained on a 3-wire trellis were superior to those trained on 1- or 2-wire trellises; amitrol at 4 lb. and dalapon at 12 lb./acre controlled weeds in blueberries; an increase in yield was obtained when raspberry canes were interwoven as compared with tied and tipped canes; strawberry rot was controlled by 3 applications of 35 lb. of 5% captan or phaltan; soil fumigation with chloropicrin at 50 and 35 gal./acre, Telone at 45 and 35 gal./acre and ethylene dibromide at 15 gal./acre increased strawberry yields; 3 applications of simazine (1 lb./acre) controlled weeds in strawberries; higher yields of Wilder red currants were obtained with plants spaced at 2 ft. in rows 9 ft. apart; large scale dying out of hops was found to be due to soil applications of heptachlor in 1956; pre-emergence applications of neburon (3 lb./acre) and dinitroamine (3 lb./acre) gave weed control in bush beans; variety trials are reported with peaches, blackberries, raspberries, strawberries, broccoli, peas, pole beans, bush beans, turnips, rutabagas, squash, cauliflowers, cucumbers, garden beets, carrots, radishes, tomatoes, rhubarb, lettuces and early-flowering, hardy chrysanthemums.

3611. WASHINGTON STATE COLLEGE.
Washington Research Progress in Agriculture and Home Economics. Report No. 10. Plant pathology, May 1960, pp. 4.

Anticarie 80 (hexachlorobenzene) controlled smut in onion seedlings; *Allium goodingei*, a wild form, proved to be resistant to smut; hop downy mildew can grow down the vine into the roots and crown where it will overwinter; raspberry yellows was found not to be a virus condition; powdery mildew in fruit trees was controlled by Karathane; Cyprex, ¾ lb./100 gal., controlled apple scab; work to obtain and preserve virus-free deciduous tree-fruit stocks is reported; Agrimycin-100 (400 p.p.m.) gave promising control of the bacterial blight of lilacs; Agrimycin (400 p.p.m.) also controlled bacterial stem decay in ornamental bulb crops; heat curing of iris bulbs accelerated blooming; storage of Wedgewood iris at 70° F. between heat curing and pre-cooling delayed flowering, as did pre-cooling to 40° instead of 50°; PCNB controlled *Sclerotium rolfsii* rot on bulbs; black rot disease was also controlled by a furrow application of PCNB together with a bulb dip of PCNB plus PMA.

3612. "WHERE TO BUY" LTD.
Where to buy everything for agriculture and horticulture, No. 11, 1960-61.
"Where to Buy" Ltd., John Adam House, 17-19 John Adam Street, London, W.C.2, 1960, pp. 152, 5s. + 8d. postage.

For the scope of this useful and comprehensive annual, see *H.A.*, 29: 980.

3613. WILHELMINADORP.
Jaarverslag 1959, Proefstation voor de Fruitteelt in de Volle Grond, Wilhelminadorp (bij Goes). **(Annual Report for 1959, of the Experiment Station for Fruitgrowing in the Open, Wilhelminadorp (near Goes).)** [English summary 4¼ pp.], pp. 80, illus.

The sections on experimental studies have been abstracted separately [see abstracts 2219, 2258, 2260 and 2291].

3614. ZÜRICH-OERLIKON.
Tätigkeitsbericht der Eidg. Landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon über das Jahr 1959. **(Annual Report of the Zürich-Oerlikon Agricultural Research Station for 1959.)**
Landw. Jb. Schweiz, 1960, **9**: 667-774, bibl. 36, illus.

Including experiments on the gibberellin treatment of peas, the boron nutrition of spinach and pests of peas.

New periodical.

3615. COCONUT RESEARCH INSTITUTE OF CEYLON.
The Ceylon Coconut Planters' Review [*Ceylon Coconut Plant. Rev.*], 1960, Vol. **1**, No. 1, 9½ × 6 in., pp. 24, illus., Coconut Research Institute of Ceylon, Bandirippuwa Estate, Lunuwila, Rs. 5 per annum.

The purpose of this review, which is to be published quarterly, is to provide coconut planters with information on all aspects of the coconut plantation industry, including the results of research, in non-technical language. It is considered that the existing *Ceylon Coconut Quarterly* is fast becoming too scientific and technical to be readily understood by the layman. The first issue contains some useful articles, two of which are noted separately, and also seasonal notes and production statistics.